DRAFT - Volumes 1-3

LOS VAQUEROS RESERVOIR EXPANSION PROJECT

Environmental Impact Statement
Environmental Impact Report

State Clearinghouse No. 2006012037

Prepared for
United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Contra Costa Water District
Western Area Power Administration

February 2009

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION

CONTRA COSTA WATER DISTRICT

Western AREA POWER ADMINISTRATION

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT for the Los Vaqueros Reservoir Expansion Project

This Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) has been prepared by the Bureau of Reclamation and the Contra Costa Water District (CCWD) in accordance with the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The Western Area Power Administration (Western) is a cooperating agency under NEPA. The reservoir expansion involves enlarging an existing reservoir, building a new intake and pump station and conveyance facilities, provides modified and new power supply facilities, and includes replacement and enhanced recreation facilities. The project purpose is to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs in the Delta and tributary river systems, and to improve water supply reliability and water quality for urban users in the San Francisco Bay Area.

The Draft EIS/EIR considers four action alternatives and the No Project/No Action Alternative. Alternative 1 includes reservoir expansion to 275 thousand acre-feet (TAF), a new Delta Intake and Pump Station, up to 19 miles of conveyance pipelines, an enlarged Transfer Facility; additional power supply facilities including a new substation; and recreation facilities. The other three alternatives include the same or fewer facility improvements than proposed under Alternative 1.

- Alternative 1 – Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management and Water Supply Reliability Dual Emphasis
- Alternative 2 – Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management Emphasis
- Alternative 3 – Expanded 275-TAF Reservoir, No South Bay Connection, Environmental Water Management Emphasis
- Alternative 4 – Expanded 160-TAF Reservoir, No South Bay Connection, Water Supply Reliability Emphasis

This Draft EIS/EIR describes and evaluates the potential environmental, social and economic effects of the Los Vaqueros Reservoir Expansion Project (reservoir expansion project). It analyzes the direct, indirect, and cumulative environmental effects of the following resources: Delta hydrology and water quality, Delta fisheries and aquatic resources, earth resources, local hydrology, biological resources, land use, agriculture, transportation and circulation, air quality, noise, utilities and public service systems, hazardous materials and public health, visual/aesthetic resources, recreation, cultural and paleontological resources, socioeconomic effects, environmental justice, Indian Trust Assets, growth-inducing effects, and climate change. The project alternatives would result in significant adverse environmental impacts, after mitigation, to Important Farmland (up to 22 acres) and a potential movement corridor for the San Joaquin kit fox on the west side of the existing reservoir. The project would result in beneficial effects on Delta fisheries and aquatic resources under Alternatives 1, 2, and 4. Alternative 3, however, could result in significant adverse effects on Delta fisheries and aquatic resources.

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"The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public."

"The Mission of the Contra Costa Water District is to strategically provide a reliable supply of high quality water at the lowest cost possible, in an environmentally responsible manner."

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Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
ACHP	Advisory Council on Historic Preservation
ACI	American Concrete Institute
ACTM	Airborne Toxics Control Measure
ACWD	Alameda County Water District
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
AF	acre-foot (feet)
AIA	Airport Influence Area
AIP	Alternative Intake Project
AIRFA	American Indian Religious Freedom Act
ALUC	Airport Land Use Commission
ALUCP	Airport Land Use Compatibility Plan
APE	Area of Potential Effect
ARB	Air Resources Board
ASIP	Action Specific Implementation Plan
ASPIS	Abandoned Sites Program Information System
A.T. & S.F.	Atchison Topeka & Santa Fe
AWWA	American Water Works Association
B	Beneficial Impact
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BART	Bay Area Rapid Transit
BAWAC	Bay Area Water Agencies Coalition
BAWSCA	Bay Area Water Supply and Conservation Agency
BBID	Byron-Bethany Irrigation District
BCDC	Bay Conservation and Development Commission
BDCP	Bay Delta Conservation Plan
BMP	Best Management Practice
BO	Biological Opinion
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAAQS	California Ambient Air Quality Standards
Cal-EPA	California Environmental Protection Agency
CALFED	CALFED Bay-Delta Program
Cal-OSHA	California Occupational Safety and Health Administration
CalSim II	California Simulation Model II; also, California Water Allocation and Reservoir Operations Model
Caltrans	California Department of Transportation
CAP	Clean Air Plan
CARB	California Air Resources Board
CBC	California Building Code
CCAA	California Clean Air Act
CCC	Contra Costa County

CCCTA	Central Contra Costa Transit Authority
CCIC	Central California Information Centers
CCWD	Contra Costa Water District
CDF	California Department of Forestry
CDFG	California Department of Fish and Game, see DFG
CDP	Census-Designated Place
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Information System
CESA	California Endangered Species Act
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
cfs	cubic foot (feet) per second
CHABA	Committee of Hearing, Bio-Acoustics, and Bio-Mechanics
CHP	California Highway Patrol
CHRIS	California Historical Resources Information System
Cl	chloride
CNDDB	California Natural Diversity Data Base
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2E	Carbon Dioxide Equivalents
COA	Coordinated Operations Agreement
CPUC	California Public Utilities Commission
CRHR	California Register of Historic Resources
CSD	Community Services District
CSLC	California State Lands Commission
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act

D/DBPR	Disinfectants and Disinfection Byproducts Rule
D-1641	Decision 1641
dB	decibel
dBA	A-weighted decibel
DBP	disinfection byproduct
dBL	low frequency decibel
DCC	Delta Cross Channel
DD	doubling of distance
DDT	dichlorodiphenyltrichloroethane
Delta	Sacramento-San Joaquin Delta
DFG	California Department of Fish and Game, see CDFG
DHS	California Department of Health Services
DMC-CA	Delta-Mendota Canal - California Aqueduct

DOC	dissolved organic carbon
DOI	Department of the Interior
DPM	diesel particulate matter
DPR	California Department of Parks and Recreation
DPS	District Population Segment
DSM2	Delta Simulation Model, Version 2
DSOD	California Department of Water Resources, Division of Safety of Dams
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
DWSP	Delta Water Supply Project
E/I	Export-to-Inflow ratio
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District
EC	electrical conductivity
ECAP	East County Area Plan
ECCCFPD	East Contra Costa County Fire Protection District
ECCCHC	East Contra Costa County Habitat Conservancy
ECCID	East Contra Costa Irrigation District
EDD	Employment Development Department
EDR	Environmental Data Resources
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EMF	Electric and Magnetic Fields
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EQ	Environmental Quality
ESA	Endangered Species Act
EWA	Environmental Water Account
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FCIR	Farmland Conversion Impact Rating
FCWCD	Flood Control and Water Conservation District
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FESA	Federal Endangered Species Act
FHWA	Federal Highway Administration
FIP	Federal Implementation Plan
FIRM	Flood Insurance Rate Maps
FMMP	Farmland Mapping and Monitoring Program
FMWT	Fall Midwater Trawl (Survey)
FPP	Farmland Protection Program
FPPA	Farmland Protection Policy Act
fps	foot (feet) per second
FRWA	Freeport Regional Water Authority
FRWP	Freeport Regional Water Project

FTA	Federal Transit Administration
FTE	full-time equivalent
FWSI	Future Water Supply Implementation
FWSS	Future Water Supply Study
GHG	Greenhouse Gases
GIS	Geographic Information System
GLO	General Land Office
GPS	Global Positioning System
HAA	haloacetic acids
HAP	hazardous air pollutants
HCP	Habitat Conservation Plan
HCP/NCCP	Habitat Conservation Plan/Natural Community Conservation Plan
HCPA	Habitat Conservation Plan Association
HEP	Habitat Evaluation Procedure
HI	Hazard Index
HPTP	Historic Property Treatment Plan
HUD	Federal Department of Housing and Urban Development
Hz	hertz
I	interstate
I-5	Interstate 5
I-580	Interstate 580
IAIR	Initial Alternatives Information Report
IBC	International Building Code
ICBO	International Conference of Building Officials
IEEPF	Initial Economic Evaluation for Plan Formulation Report
IEP	Interagency Ecological Program
IPCC	Intergovernmental Panel on Climate Change
IRWMP	Integrated Regional Water Management Plan
IS/MND	Initial Study/Mitigated Negative Declaration
ITAs	Indian Trust Assets
JPOD	Joint Point of Diversion
km	kilometer
kV	kilovolt
kV/m	kilovolt per meter
LAVTA	Livermore Amador Valley Transit Authority
Ldn	day/night noise level
LEDPA	Least Environmentally Damaging Practicable Alternative
LESA	Land Evaluation and Site Assessment
Leq	equivalent noise level
Lmax	maximum noise level
Lmin	minimum noise level

LOS	Level of Service
LOX	Liquid Oxygen
LS	Less-than-Significant Impact
LSM	Less-than-Significant Impact with Mitigation
LSZ	Low Salinity Zone
LUST	Leaking Underground Storage Tank
LV	Los Vaqueros
LVP	Los Vaqueros Project
LX	statistical descriptor
M	moment magnitude
M&I	municipal and industrial
MACT	maximum achievable control technology
MAF	million acre feet
MBTA	Migratory Bird Treaty Act
MCE	Maximum Credible Earthquake
MCL	Maximum Contaminant Level
MDBP Rules	Microbial and Disinfection Byproducts Rules
MEI	Maximally Exposed Individual
mG	miligauss
MG	million gallons
mg/L	milligram per liter
MID	Modesto Irrigation District
MLD	Most Likely Descendant
mm	millimeter
MMHOS/CM	millimhos per centimeter
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	miles per hour
MPP	Multi-Purpose Pipeline
MSCS	Multi-Species Conservation Strategy
MSL	mean sea level
MTC	Metropolitan Transportation Commission
MUN	municipal and domestic supply
MW	megawatts
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGRPA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission
NCCP	Natural Community Conservation Plan
NCCPA	Natural Communities Conservation Planning Act
NDOI	Net Delta Outflow Index
NEHRP	National Earthquake Hazards Reduction Program
NEHRPA	National Earthquake Hazards Reduction Program Act
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for HAPs

NHPA	National Historic Preservation Act
NI	No Impact
NMFS	National Marine Fisheries Service
NO	nitric oxide
NO_2	Nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NOTAM	Notice to Airmen
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
NWIC	Northwest Information Center
NWS	Naval Weapons Station
OCAP	Operations Criteria and Plan
OEHHA	Office of Environmental Health Hazard Assessment
OES	Office of Emergency Services
OHP	Office of Historic Preservation
OHWM	ordinary high water mark
OMB	Office of Management and Budget
OPR	Office of Planning and Research
OSHA	U.S. Department of Labor Occupational Safety & Health Administration
P.L.	Public Law
PA	Programmatic Agreement
PCE	Primary Constituent Elements
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas and Electric
PM	Particulate matter
POD	Pelagic Organism Decline
ppm	Parts per million
ppt	Parts per thousand
PPV	Peak particle velocity
PRC	Public Resources Code
PRPA	Paleontological Resources Preservation Act
PTM	Particle tracking model
QWEST	Parameter that represents the estimated net westward flow of the San Joaquin River at Jersey Point
RBDD	Red Bluff Diversion Dam
RCRA	Resource Conservation and Recovery Act

RD	Reclamation District
REC	Recognized Environmental Condition
RECLAMATION	U. S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region
RFTA	Reserve Forces Training Area
RMS	root mean square
ROD	Record of Decision
ROG	reactive organic gases
ROW	right-of-way
RTS	reservoir triggered seismicity
RWQCB	Regional Water Quality Control Board
SBA	South Bay Aqueduct
SCVWD	Santa Clara Valley Water District
SDIP	South Delta Improvement Program
SDWA	Safe Drinking Water Act
SEL	Single Event (Impulsive) Noise Level
SFBAB	San Francisco Bay Air Basin
SFPUC	San Francisco Public Utilities Commission
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SJMSCP	San Joaquin Multi-Species Habitat Conservation and Open Space Plan
SJRHR	San Joaquin River Hydrologic Region
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Air Pollution Control District
SKT	Spring Kodiak Trawl (Survey)
SMCL	Secondary Maximum Containment Level
SO_2	Sulfur dioxide
SOD	South of Delta
SR	State Route
SR-4	State Route 4
SRA	State Recreation Area
SRHR	Sacramento River Hydrological Region
SSUAF	Sonoma State University Academic Foundation
SU	Significant Unavoidable Impact
SWC	State Water Contractors
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
SWTR	Surface Water Treatment Rule
TAC	toxic air contaminants
TAF	thousand acre-foot (feet)
TBACT	Toxic Best Available Control Technology
TDS	Total Dissolved Solids
TERPS	Terminal Instrument Procedures
Tg	Teragrams
THM	trihalomethanes

TMDL	Total Maximum Daily Load
TNS	Summer Tow Net (Survey)
TOC	total organic carbon
TPY	tons per year
U.P.	Union Pacific
UCMP	University of California Museum of Paleontology
ULL	Urban Limit Line
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USNWS	United States National Weather Service
UST	Underground Storage Tank
UWMP	Urban Water Management Plan
V	Volt
VAMP	Vernalis Adaptive Management Plan
Vdb	decibel notation
VDE	Visible Dust Emissions
VMT	vehicle miles traveled
WDR	Waste Discharge Requirements
Western	Western Area Power Administration
WMO	World Meteorological Organization
WQCP	Water Quality Control Plan
X2	2 parts per thousand salinity isohaline
Zone 7	Alameda County Flood Control and Water Conservation District, Zone 7
µS/cm	MicroSiemens per centimeter

EXECUTIVE SUMMARY

ES.1 Introduction

The Contra Costa Water District (CCWD) and the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) have prepared this Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) to evaluate the potential environmental effects of the Los Vaqueros Reservoir Expansion Project (reservoir expansion project) in accordance with the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). CCWD is the lead agency under CEQA and Reclamation is the lead agency under NEPA. The Draft EIS/EIR provides information about the project alternatives and the potential direct, indirect, and cumulative environmental effects of the project alternatives. Federal decision making will be based on information in the Federal Feasibility Report, currently under development, in addition to the information in this document.

The San Francisco Bay/Sacramento–San Joaquin Delta Estuary is the largest estuary on the West Coast and provides essential habitat for a diverse array of fish and wildlife. It is also the critical hub in the conveyance of drinking water supplies to more than two-thirds of the California population and irrigation supplies to seven million acres of agricultural lands.

In response to worsening ecological conditions and increasing risk to water supplies, the Governor of California has assembled a task force to develop "a durable vision for sustainable management of the Delta" with the goal of "…managing the Delta over the long term to restore and maintain identified functions and values that are determined to be important to the environmental quality of the Delta and the economic and social well-being of the people of the state." The first recommendation in the task force report states that: "Delta ecosystem and a reliable water supply for California are the primary, co-equal goals for sustainable management of the Delta" (Delta Vision Blue Ribbon Task Force, 2007). This state-initiated planning process, known as Delta Vision, builds and expands upon the work of the CALFED Bay-Delta Program (CALFED), which included twelve program areas including ecosystem restoration, water supply reliability, water quality, storage, conveyance and the Environmental Water Account (EWA). Expansion of the existing Los Vaqueros Reservoir (the reservoir), owned and operated by CCWD, is one of five surface water storage projects identified for further investigation by CALFED.

The Los Vaqueros Reservoir is an off-stream storage reservoir near the Delta. CCWD currently pumps water from the Delta through state-of-the-art fish screens into this 100-thousand acre-foot (TAF) capacity reservoir. Having this storage capacity allows CCWD to improve the water quality delivered to its customers and to adjust the timing of its Delta water diversions to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment.

Expanding the reservoir and related facilities presents an opportunity to expand these benefits, furthering the goals of Delta Vision and CALFED through a cooperative effort among CCWD and project participants, and through coordinated operations with the California Department of Water Resources' (DWR) State Water Project (SWP) and Reclamation's Central Valley Project (CVP). Through the use of the expanded reservoir and existing, new, and expanded facilities, substantial new benefits can be generated for fishery protection, environmental water management, and Bay Area water supply reliability.

This Draft EIS/EIR evaluates four alternatives for expanding the reservoir; three alternatives would increase the capacity to 275 TAF; the fourth would increase capacity to 160 TAF. Under the largest two alternatives studied, CCWD would expand the existing reservoir and add a new South Bay Connection to use the Los Vaqueros system to provide water to South Bay water agencies – Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7), Alameda County Water District (ACWD), and Santa Clara Valley Water District (SCVWD) – that otherwise would receive all of their Delta supplies through the existing SWP and CVP export pumps. The new and expanded facilities would be operated in coordination with Reclamation and DWR to shift Delta pumping for the three South Bay water agencies from the CVP and SWP Delta export pumps to the expanded Los Vaqueros reservoir system. The expanded storage coupled with shifting the pumping location to state-of-the-art fish screens would provide substantial benefits of protecting fish and reducing fish losses, developing and storing environmental water supplies, and improving Bay Area water supply reliability.

Studies of the reservoir expansion project began in 2001, managed by CCWD and supported and funded by Reclamation and DWR. Following preliminary planning studies that demonstrated the expansion project could result in environmental, water supply reliability and water quality benefits, voters in CCWD's service area were asked whether CCWD should consider expansion of its reservoir. The 2004 advisory ballot measure won approval of 62 percent of the voters. Since the vote, the proposed expansion project has been further developed and refined through detailed studies and extensive public outreach.

This Draft EIS/EIR describes the objectives, purpose and need, alternatives, benefits, and effects of the proposed reservoir expansion project. Four action alternatives that present different combinations of facility and water delivery options for expanding Los Vaqueros Reservoir and the No Project/No Action Alternative are evaluated. The emphasis of this document and the underlying analysis is on evaluating a range of alternatives to fully characterize the potential environmental effects and identify appropriate mitigation measures. Brief summaries of the potential environmental water management, water supply reliability, and water quality benefits that the project alternatives would provide are also included in this Executive Summary.

ES.1.1 Project Objectives

The Los Vaqueros Reservoir Expansion Project objectives are to use an expanded Los Vaqueros Reservoir system to:

Primary Objectives:

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.
- Increase water supply reliability for water providers within the San Francisco Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

- Improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

ES.1.2 Project Purpose and Need

The project purpose is to use an expanded Los Vaqueros Reservoir system to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs in the Delta and tributary river systems, and to improve water supply reliability for urban users in the San Francisco Bay Area.

The need for this project is driven by the following conditions:

- The Delta ecosystem is in a state of serious decline, with primary productivity very low and fish populations decreasing to record low levels, putting at least one species (the delta smelt) on the brink of extinction.
- Insufficient quantities of water and lack of storage and flexibility in managing the timing and location of diversions for environmental and municipal water supplies are contributing to the ecosystem's decline.
- Ecosystem decline has put other beneficial uses of water supplies conveyed through the Delta at risk, leading to court-ordered limits on Delta pumping and greatly reducing water supply reliability for millions of people.

Improved storage and conveyance of environmental water supplies can help improve the Delta ecosystem conditions and reduce conflict among beneficial uses of Delta water supplies.

ES.2 Project Background

The Sacramento–San Joaquin Delta is an area of transition between the freshwater runoff from the Sacramento and San Joaquin Rivers and the tidally driven saltwater flows from the Pacific Ocean and San Francisco Bay. The Delta serves as habitat for a rich ecosystem of aquatic, terrestrial, and avian species, including more than 30 species protected under federal and state regulations. The aquatic habitat supports anadromous fish such as chinook salmon and steelhead trout that pass through the Delta on their way to the ocean and back to upstream rivers to spawn, as well as many resident species such as delta smelt that live their entire lives in the Delta. All these species are susceptible to flow and water quality conditions in the Delta. The Delta also supports an extensive sport and commercial fishery.

The Delta is also critical to California's economy, supplying drinking water for more than two-thirds of Californians and irrigation water for 7 million acres of highly productive agricultural land. The Delta is also a key component of California's two largest water distribution systems: the CVP, operated by Reclamation, and the SWP, operated by DWR. Both the federal and state systems pump water out of the southwestern Delta to agricultural and urban contractors in the Bay Area and in central and southern regions of the state.

ES.2.1 Delta Challenges

The following critical elements of the Delta crisis are closely related to the project purpose, objectives, and need for the reservoir expansion project.

Declining Delta Ecosystem. Annual monitoring of fish abundance since 2000 includes record lows of delta smelt and young striped bass, and near-record lows of longfin smelt and threadfin shad (Resources Agency, 2007). Many factors have been cited for the decline of the Delta ecosystem generally, and for fish species in particular[1]. On December 14, 2007, U.S. District Court Judge Oliver Wanger issued an Interim Order curtailing water exports from the Delta to protect delta smelt (Delta Export Restrictions) until a new biological opinion is issued by the U.S. Fish and Wildlife Service (USFWS) (NRDC, et al., 2007).

Insufficient Water Supply for Environmental Purposes. The Central Valley Project Improvement Act (CVPIA, Public Law 102-575) was enacted in 1992 to "protect, restore, and enhance fish, wildlife and associated habitats in the Central Valley and Trinity River basins of California" as well as to improve the operations flexibility of the CVP. It contains numerous requirements to modify CVP operations and acquire water to protect and restore fisheries, Central Valley wildlife refuges, and other habitats and species. Reclamation has not been able to consistently provide the water needed to achieve the CVPIA goals. For example, Reclamation has been able to secure some, but not all, of the supplemental refuge water supply for these wetland habitat areas (Reclamation, 2006). Constraints in meeting the CVPIA targets include cost and availability of water, pumping capacity, storage and conveyance infrastructure.

Lack of Management Flexibility. The existing federal and state water systems lack flexibility in terms of when, where, and how water is pumped from the Delta. This lack of flexibility adds to the difficulty of addressing fish impacts, ecosystem decline, and supply reliability problems.

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1 Invasive species; low primary productivity (phytoplankton); increasing temperatures; reduced and altered timing of inflows to the Delta; increased and altered timing of exports from the Delta; declining water quality due to increased discharges from wastewater treatment plants, agricultural drains, industrial operations, and non-point sources; changes in physical and chemical parameters such as flow and salinity; and loss of wetlands and floodplains to urbanization and agricultural land conversion (Healey, 2007 and Baxter, et al., 2008).

CALFED's EWA Program is an example of an environmental water program aimed at protecting Delta fish species by increasing flexibility in SWP and CVP operations. The EWA has operated since 2001 to provide water "to augment streamflows, Delta outflows, to modify exports to provide fishery benefits and to replace the regular project water supply interrupted by the changes to project operations" (CALFED, 2000). A 2007 CALFED evaluation of the existing EWA Program found that the lack of storage for EWA water assets south of the Delta is a serious constraint on EWA management and affects the ability to make the best use of the water for environmental purposes (CALFED, 2007).

Decreasing Supply Reliability. Bay Area water agencies rely heavily on water supplies conveyed through the Delta to meet their normal year demands and prepare them for drought periods. CCWD customers receive almost 90 percent of their supply from the Delta. The three South Bay water agencies that receive SWP water - ACWD, SCVWD and Zone 7 - each receive 40 to 65 percent of their supply from the Delta (ACWD, 2005; SCVWD, 2005; Zone 7, 2005). Delta water supply reliability can be adversely affected by both dry year conditions and regulatory actions to protect Delta fish that constrain Delta pumping. Meeting the flow requirements in the federal-court issued Delta Export Restrictions to protect delta smelt has necessitated CVP and SWP Delta export pumping curtailments that reduce the reliability of water supplies delivered to urban and agricultural water users dependent on these pumps. For example, in February 2008, DWR notified SWP contractors that they would receive just 35 percent of their requested supplies in 2008, which is significantly less than the 60 percent of requested supplies initially projected for calendar year 2008. Catastrophic emergency events such as earthquakes, chemical spills, or levee failures also could affect the Delta and the delivery of Delta water supplies.

Declining Drinking Water Quality. Delta water quality for drinking water supplies has generally declined because of saltwater intrusion resulting from water resources management actions; polluted runoff from urban, agricultural, and other land development; and changes in the physical environment. Seasonal variations as well as longer-term degradation of Delta water quality result in elevated salinity, total dissolved solids, bromide, total organic carbon, and algae concentrations, and high levels of hardness and turbidity, which can affect treatment cost and effectiveness, taste and odor, and health considerations.

ES.2.2 Planning Process and Potential Participants

Since 1995, federal, state, and local agencies and stakeholders have been exploring water storage as one of the potential solutions to numerous water resource challenges in the Bay-Delta system. The CALFED Record of Decision (ROD) includes the expansion of Los Vaqueros Reservoir as one of five water storage projects identified for further investigation as part of the CALFED Storage Program. CALFED also identified the need to provide environmental water in the Delta and its tributaries to improve fish habitat and protection, particularly related to the impacts of pumping at the SWP and CVP Delta export facilities.

Los Vaqueros Reservoir Expansion Planning

The planning phase of the Los Vaqueros Reservoir Expansion Project began in January 2001. Since 2001, extensive public outreach has been conducted and numerous studies of the reservoir expansion project have been completed to identify project alternatives, evaluate project benefits and costs, and assess potential environmental effects. These studies have been documented in the following project reports, which are available on the project web site at www.lvstudies.com (Reclamation, 2006; Reclamation; 2005; CCWD, 2004; CCWD, 2002).

- Initial Economic Evaluation for Plan Formulation Report, July 2006
- Initial Alternatives Information Report, September 2005
- Final Draft Planning Report, April 2004
- Project Concept Report, August 2002

Other studies are in progress to develop more detailed information on the potential project benefits and costs, and the allocation of costs to potential project beneficiaries, and project participants. Such efforts will result in reports to support federal and state decision making.

- Federal Feasibility Report
- State Feasibility Report

Potential Project Participants and Interests

Since 2001, CCWD and Reclamation have worked with DWR and other potential project beneficiaries to develop and refine the alternatives to meet project objectives while minimizing or avoiding impacts and causing no harm to other water users. Alternatives development has been guided by the following interests and principles:

Federal – The potential federal interest in the reservoir expansion project includes the protection and restoration of Delta fisheries, water supplies for environmental purposes, including fisheries and wetland habitat, and the reliability of Bay Area CVP contract supplies. The type and extent of federal interest will be determined by the appropriate decision makers based on the separate Federal Feasibility Report and other pertinent information.

State – The potential state interest in the reservoir expansion project includes the protection and restoration of Delta fisheries, water supplies for environmental purposes, and the reliability and quality of Bay Area SWP contract supplies. The type and extent of state interest will be determined by the appropriate decision makers based on the separate State Feasibility Report and other pertinent information.

Regional and Local – Should they choose to participate, the three South Bay water agencies' interest in the reservoir expansion project includes the protection and restoration of Delta fisheries and the reliability and quality of South Bay water supplies. The greater Bay Area interest in the project includes the addition of local emergency storage.

CCWD – CCWD's interest in the reservoir expansion is to maintain and expand the water quality benefits of the reservoir for its customers, gain water supply reliability benefits, and coordinate reservoir operations with federal and/or state water operations to protect and restore Delta fisheries and provide other environmental benefits. CCWD Board of

Directors' Resolution No. 03-24 (June 25, 2003) provides further guidance for formulating alternatives for expanding the reservoir (see Sidebar). An advisory vote was held on March 2, 2004 and customers within CCWD's service area voted 62% in favor of reservoir expansion.

In Resolution No. 03-24 the CCWD Board determined "that the District will not participate in or support the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir unless the Board determines that the CALFED Bay-Delta Program proposal meets the following conditions:

1. Improves drinking water quality for CCWD customers beyond that available from the existing Los Vaqueros Project;
2. Improves the reliability of water supplies for CCWD customers during droughts;
3. Enhances Delta habitat and protects endangered Delta fisheries and aquatic resources by installing state-of-the-art fish screens on all new intakes and creating an environmental asset through improved location and timing of Delta diversions and storage of water for environmental purposes;
4. Increases the protected land and managed habitat for terrestrial species in the Los Vaqueros Watershed and the surrounding region;
5. Improves and increases fishing, boating, hiking, and educational opportunities in the Los Vaqueros Watershed, consistent with the protection of water quality and the preservation of the watershed and the watershed's unique features;
6. CCWD continues as owner and manager of the Los Vaqueros Watershed;
7. CCWD maintains control over recreation in the Los Vaqueros Watershed;
8. CCWD continues as operator of the Los Vaqueros Reservoir system;
9. CCWD will be reimbursed for the value of the existing Los Vaqueros Project assets shared, replaced, rendered unusable or lost with the expansion project and said reimbursement will be used to purchase additional drought supply and water quality benefits or reduce debt on the existing Los Vaqueros Project;
10. Water rates for CCWD customers will not increase as a result of the expansion project."

Other Related Planning Processes

There are several ongoing planning processes underway with the potential to affect the future of the Delta. These processes are intended to identify long-term programs and projects to restore a sustainable Delta. The expansion of Los Vaqueros Reservoir would contribute to creating a sustainable Delta and can be coordinated with these parallel planning processes.

Delta Vision and Strategic Plan. The Delta Vision and Strategic Plan were formulated by the Blue Ribbon Task Force appointed by Governor Schwarzenegger to develop a durable vision for sustainable management of the Delta. In December 2007, the Task Force released its report "Delta Vision: Our Vision for the California Delta" (Delta Vision Blue Ribbon Task Force, 2007). The Delta Vision Strategic Plan was completed in November 2008 (Delta Vision Blue Ribbon Task Force, 2008). The Strategic Plan concluded that the Delta must be managed according to two coequal goals: "Restore the Delta ecosystem and create a more reliable water supply for California". Then, at the end of 2008 the Delta Vision Committee submitted its final implementation plan to the Governor with recommended actions to manage the Delta to fulfill its coequal goals of water supply reliability and ecosystem restoration. The Delta Vision Committee Implementation Report sets priorities based on the Strategic Plan and was released to the public in January 2009 (Delta Vision Committee, 2008). Although consistent with recommendations in the Delta Vision (e.g., Recommendations 7, 8, and 9) and the Strategic Plan, the Los Vaqueros Reservoir Expansion Project is independent of this planning effort. Decisions on whether and how to proceed with any of the alternatives evaluated in this Draft EIS/EIR are not tied to implementation of the Delta Vision Strategic Plan.

Bay Delta Conservation Plan. The Bay Delta Conservation Plan (BDCP) is being developed consistent with section 7 and section 10 of the Federal Endangered Species Act, and either section 2835 or section 2081 of the State Fish and Game Code to result in the issuance of incidental take permits for covered activities. The covered activities would include, among others, operation of the CVP and SWP, facility improvements for the CVP and SWP, new Delta conveyance facilities, and habitat conservation measures included in the BDCP. The reservoir expansion project is not a covered activity in the BDCP; decisions on whether and how to proceed with any of the project alternatives evaluated in this Draft EIS/EIR are not tied to completion or implementation of the BDCP.

Operations Criteria and Plan. USFWS and the National Marine Fisheries Service (NMFS) have been required by federal court orders in *Pacific Coast Federation of Fishermen's Associations v. Gutierrez* (*PCFFA*, 2008) and *Natural Resources Defense Council, et al. v. Kempthorne* (*NRDC et al.*, 2007) to issue new biological opinions based on the 2008 Operations Criteria and Plan (OCAP) for operating the SWP and CVP. USFWS issued its biological opinion on December 15, 2008. NMFS is currently preparing its biological opinion with a target for completion by mid-summer 2009.

The analyses pertaining to operations of the SWP and CVP in this document are based on the Interim Order issued by Judge Wanger and the 2004 OCAP. Because NMFS has not yet issued its biological opinion, it is not yet possible to assess the changes to SWP and CVP operations that may occur due to the combined effects of the USFWS and NMFS biological opinions for the 2008 OCAP. Reclamation and DWR intend to complete an analysis of the effects that the new biological opinions will have on the operations of SWP and CVP. It is possible that the new opinions may result in moderate to severe fishery restrictions being imposed on Delta exports, depending on annual hydrologic conditions, above and beyond those caused by the Interim Order. The analysis of the effects of the new biological opinions on the operations of the SWP and CVP will be described in the Final Federal Feasibility Report and Final EIS/EIR for this project.

The 2008 OCAP biological opinions will cover the effects of the joint operations of the SWP and CVP on federally listed threatened and endangered species and their critical habitat and will not include operations of the Los Vaqueros Reservoir Expansion Project. The reservoir expansion project would be subject to its own biological opinions, which are expected to take into account the 2008 OCAP.

Agency Planning and Coordination

CCWD is the lead agency under CEQA and has been managing the reservoir expansion project studies with funding from both Reclamation and DWR. Reclamation is the lead agency under NEPA. Reclamation's involvement is authorized by Congress through Public Laws 108-7 and 108-361, which authorized Reclamation to undertake a feasibility study of expanding the reservoir and to pursue its development, along with other ongoing environmental and storage projects, in a balanced manner. DWR's interest in the reservoir expansion project started with the state's commitment to the CALFED Storage Program and continues based on recognized needs to restore reliability to SWP contractors in the Bay Area while meeting CALFED goals of ecosystem restoration in the Delta.

These three agencies have coordinated project planning and the environmental review with the other potential project beneficiaries and regulatory agencies, which include the following agencies:

- The South Bay water agencies who receive contract supplies from the SWP and/or the CVP and would benefit from increased water supply reliability – ACWD, SCVWD, and Zone 7
- Federal and state natural resource management agencies, who along with Reclamation and DWR plan, manage, regulate, and acquire environmental water for fisheries and wildlife refuges – California Department of Fish and Game (CDFG), USFWS, and NMFS
- The Western Area Power Administration (Western), a federal agency that delivers hydroelectric power to the CVP and to CCWD's existing Los Vaqueros facilities

Several of the federal, state and local agencies described above have participated and provided input on the planning process through the Agency Coordination Work Group (ACWG). The interagency coordination process is described in the Memorandum of Understanding (Los Vaqueros MOU) among the agencies that was completed in April 2001 and extended through 2010 (DWR et al., 2001). In addition, Western formally agreed to participate in the environmental review as a federal cooperating agency as a result of its potential role approving power transmission facilities for the reservoir expansion project.

Evaluation of Potential Benefits

The evaluation of benefits described in this report is intended to provide information for potential project participants and to provide a basis for evaluating potential environmental impacts. If the lead agencies decide to pursue the project following this environmental analysis, additional analyses of the extent of these benefits will be necessary for potential project partners, including state and federal government agencies, to determine their level of interest and willingness to make a financial commitment to the proposed project.

Benefits referred to in this Draft EIS/EIR are not the same as benefits used to justify federal interest in a Federal Feasibility Report; rather benefits indicate than an effect is beneficial instead of detrimental to the environment.

ES.3 Description of Project Alternatives

The action alternatives evaluated in this Draft EIS/EIR involve an expansion of Los Vaqueros Reservoir to increase the flexibility of Delta operations serving CCWD and the South Bay water agencies (ACWD, SCVWD, and Zone 7) to improve Delta conditions for fish, provide additional environmental water for fish and/or wildlife refuges, and improve water supply reliability and water quality for Bay Area water agencies. The alternatives reflect a potential range of facility configurations and operations.

The No Action Alternative is required pursuant to NEPA (40 CFR 1502.14.d) and a No Project Alternative is required for CEQA compliance (CEQA Guidelines Sections 15125 and 15126.e). Hereafter called the No Project/No Action Alternative, this alternative assumes the existing and likely future conditions in the project area without implementation of any of the action alternatives. Under the No Project/No Action Alternative, it is assumed that the existing reservoir and conveyance system would remain in place, although operations may change. From the federal planning perspective, the No Action Alternative is the default choice unless federal involvement is demonstrated to be feasible, justified, and in the federal interest.

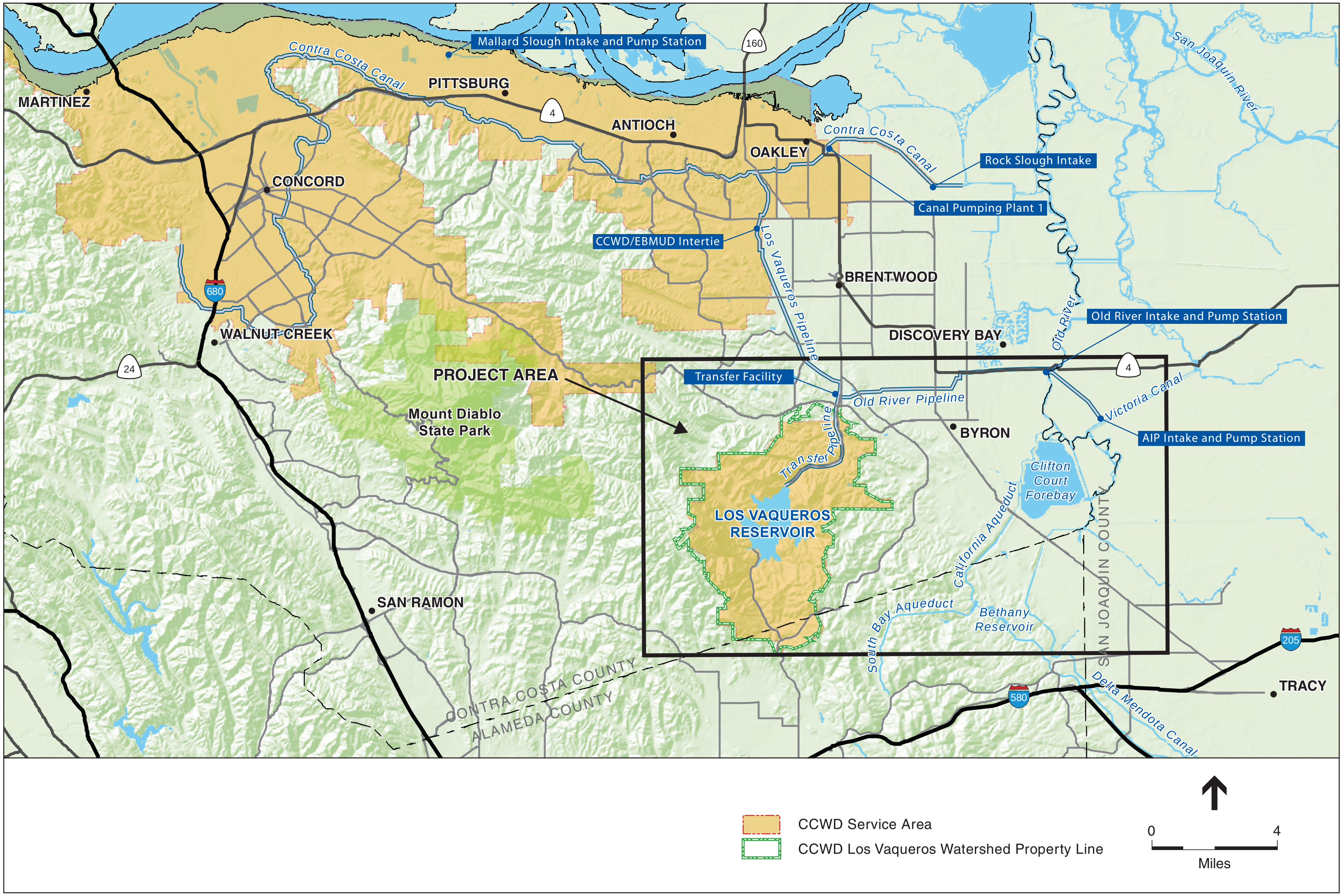
The four action alternatives described below could provide a combination of environmental water management, water supply reliability, and drinking water quality improvements, depending on the alternative selected and the final project participants. Alternative 1 is considered the Proposed Project for purposes of CEQA and it is treated as the Proposed Action for purposes of NEPA. Alternative 1 includes the largest reservoir expansion and greatest extent of associated facilities considered in this Draft EIS/EIR and is designed to meet both of the primary project objectives. At the other end of the range, Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities. At this stage of planning and evaluation, none of the alternatives has been designated as the Preferred Alternative under NEPA or the Least Environmentally Damaging Practicable Alternative (LEDPA) under Section 404(b)(1) of the federal Clean Water Act because related engineering, economic, and financial feasibility analyses are not yet complete.

Regardless of the alternative, the expanded reservoir system would create a new level of flexibility to respond to Delta conditions that change from season to season and year to year. The Draft EIS/EIR alternatives frame and analyze the range of potential operations and thus the range of potential impacts. Actual operations would fall within the range analyzed but would vary from the scenarios analyzed and would likely vary from year to year. The expanded reservoir could be managed to further optimize reservoir operations to maximize the benefits without causing adverse impacts beyond the range identified in this Draft EIS/EIR.

ES.3.1 Project Location

Los Vaqueros Reservoir lies in the foothills west of the Delta in Contra Costa County at the eastern edge of the Bay Area (**Figure ES-1**). It is an off-stream reservoir, meaning that it relies on water being pumped into it from another location (in this case, the Delta), rather than being located on a river and intercepting natural flows.

Los Vaqueros Reservoir is strategically located adjacent to the Delta and near state and federal water supply facilities including the South Bay Aqueduct (SBA), providing an opportunity to convey Delta water to the South Bay water agencies through the Los Vaqueros system rather than through the SWP and CVP Delta export pumps.



SOURCE: USGS, 1993 (base map); and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure ES-1
Project Area Location

ES.3.2 Overview of Alternatives

This Draft EIS/EIR evaluates four action alternatives that represent different combinations of facility and water system operations for expanding Los Vaqueros Reservoir and associated water conveyance. A No Project/No Action Alternative is also evaluated as required by CEQA and NEPA. As summarized below, Alternatives 1 and 2 include the largest reservoir expansion (to 275 TAF) and the South Bay Connection to serve the three South Bay water agencies (ACWD, SCVWD and Zone 7). Alternatives 1 and 2 differ in the operational emphasis between environmental water management and water supply reliability. Alternatives 3 and 4 have no South Bay Connection, and differ as to the size of the expanded reservoir (a 275 TAF versus a 160 TAF reservoir); Alternative 3 and 4 also differ in operational emphasis. Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities.

All four alternatives provide improvements and benefits for environmental water management, water supply reliability, and water quality to varying degrees in comparison to the No Project/No Action Alternative. The operational assumptions analyzed for the alternatives are intended to provide information about the changes in environmental impacts or project benefits that might result from both differing water management scenarios and differing facilities. Assumptions regarding operations were chosen to bracket a range of potential operations and associated impacts. The project benefits, on the other hand, could be greater than those identified in this Draft EIS/EIR because operation of any selected alternative could be adaptively managed to maximize project benefits without increasing adverse environmental effects.

The Los Vaqueros Reservoir Expansion Project is intended to provide a broad variety of benefits, including Delta fisheries protection and enhancement, Bay Area water supply reliability, and water quality improvement. The EIS/EIR's discussion of these benefits is necessarily based on facts and reasonable projections of future conditions available when the analysis was conducted. The extent of the benefits achieved in each of these areas will depend on several factors, including future Delta conveyance and habitat improvements, Delta operations requirements, and the project's precise environmental water management actions as further developed in project permits and agreements with project partners.

Several analyses were performed to evaluate the benefits and impacts of the Los Vaqueros Reservoir Expansion Project on Delta fisheries under a range of project operations, as described in Section 4.3 of the Draft EIS/EIR. Each of the methods used in the Draft EIS/EIR for evaluating fishery effects provides useful information, but each method also has limitations; the suite of methods were used together to develop a comprehensive understanding of project impacts and benefits. The analyses universally show that the project (Alternatives 1, 2 and 4) has no adverse impacts on fish, and provides a range of benefits for fish, including changing the timing of water diversions, improvement in flow conditions, temperature, or other benefits that contribute to restoration of aquatic ecosystems and native fish and wildlife. The actual level of benefits achieved would ultimately depend on the project alternative selected and its final permits, including federal and state endangered species act permits, and any other requirements under state or federal law.

Table ES-1 summarizes the key distinctions among the four action alternatives. The project alternatives could be constructed and in operation by 2014 if required approvals, authorizations, appropriations, and permits are obtained.

TABLE ES-1
RESERVOIR EXPANSION ALTERNATIVES
WITH KEY DISTINGUISHING CHARACTERISTICS

Project Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Storage Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water/Benefits & Water Supply Reliability	Environmental Water/Benefits	Environmental Water/Benefits	Water Supply Reliability
New South Bay Connection?	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170 cfs intake facility on Old River	Construct new 170 cfs intake facility on Old River	Expand existing CCWD intake facilities by 70 cfs	No changes to existing intake facilities
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 570 cfs	No changes to pipeline capacity

Project Facilities

Alternatives 1 and 2 include increasing the existing 100 TAF reservoir storage capacity to 275 TAF and a new South Bay Connection with a capacity of up to 470 cubic feet per second (cfs) to connect the expanded reservoir to the SBA facilities at Bethany Reservoir. Alternatives 3 and 4 do not include the South Bay Connection and Alternative 4 includes a smaller reservoir expansion to 160 TAF.

System Operations

Alternatives 1 and 2 would shift a major portion of the Delta supply diversion location and timing for the three South Bay water agencies from the SWP and CVP export pumps to the expanded Los Vaqueros system. When operated in coordination with the SWP and CVP systems, the expanded Los Vaqueros system’s screened intakes and reservoir can provide substantial improvement and flexibility for fish protection, environmental water supplies, and Bay Area water supply reliability. Fish protection benefits result from improved fish screening through state-of-the-art fish screens, application of a no-diversion period during the most critical times for fish, multiple intake locations to avoid fish, and added flexibility in timing the pumping curtailment at SWP and CVP Delta export facilities to provide greater fish benefits.

Alternatives 1 and 2 vary the use of the expanded storage between environmental water management and supply and water supply reliability. Water supply reliability would be provided by restoring some Delta supplies lost due to current regulatory restrictions on SWP and CVP export pumping, storing water in wet years for use in dry years, and increasing available storage for emergencies. Alternative 2 includes dedicated storage for environmental water supplies. Alternatives 1 and 2 also would provide incidental improvements in the water quality delivered to three South Bay water agencies by providing higher quality water from the reservoir instead of the Delta when salinity increases in the Delta and by reducing the amount of time that water is delivered through Clifton Court Forebay where warm, shallow, slow-moving water often results in algae growth and a resulting increase in organic carbon content and taste and odor issues. Additional storage also improves water quality for CCWD in dry years. Alternatives 3 and 4 would be operated to provide fish protection, environmental water supply, and water supply reliability benefits without the South Bay Connection. These two alternatives would also provide incidental water quality improvements.

Water Rights and Coordinated Operations

None of the alternatives would involve diverting more water from the Delta than allowed under existing water rights or changing the ownership or priority of those water rights. The project alternatives would change the timing and location of diversions such that fish protection, environmental water supplies, and Bay Area water supply reliability would improve. It is anticipated that existing water right permits held by CCWD, Reclamation, and/or DWR may need to be modified.

In addition to its long-term contract with Reclamation, CCWD has separate water rights for the Los Vaqueros Reservoir. CCWD's separate Los Vaqueros water rights are subject to permit terms and conditions to ensure they do not adversely affect the CVP and SWP operations under the water rights held by Reclamation and DWR, respectively. Under all these water system operations, the use of the collective water rights of the project participants would be coordinated to operate the existing and new facilities in a manner designed to accomplish the project objectives without adversely affecting CVP or SWP operations. This would be achieved through agreements among the parties and permit changes as necessary.

No Project/No Action Alternative

Under this alternative, CCWD and Reclamation would not implement the Los Vaqueros Reservoir Expansion Project. However, CCWD, Reclamation, and others potentially served by the project would proceed with other activities and projects to maintain, modify and/or expand their existing water systems in accordance with their respective plans and active project proposals. No environmental water management supplies would be provided, and existing diversions to the three South Bay water agencies would continue through the existing SWP and CVP export pumps as they do now. No additional water supply reliability or emergency supplies would be provided.

To maintain supply reliability to its customers, CCWD would implement actions identified in its Future Water Supply Study (CCWD, 1998), including acquisition of water transfers as needed to provide reliable dry-year water supply. CCWD would also operate its approved Alternative Intake Project (AIP; a new intake on Victoria Canal), which is currently under construction.

Under this alternative, no new South Bay Connection to the Bethany Reservoir would be constructed. The approved enlargement of the SBA, now in progress, would be completed but no other changes to the SBA conveyance system or operation are anticipated at this time. The No Project/No Action Alternative also does not include changes to SWP or CVP facilities. Other Bay Area water agencies would continue to operate under their current plans.

DWR and Reclamation are beginning studies on potential modifications to the existing water conveyance system through the Delta (DWR Notice of Preparation for Bay Delta Conservation Plan (BDCP) EIR/EIS, issued March 17, 2008) but no specific project(s) can yet be considered a likely part of the No Action/No Project future scenario. No other new projects sponsored by Reclamation on the CVP system are included in this alternative.

Alternative 1: Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management and Water Supply Reliability Dual Emphasis

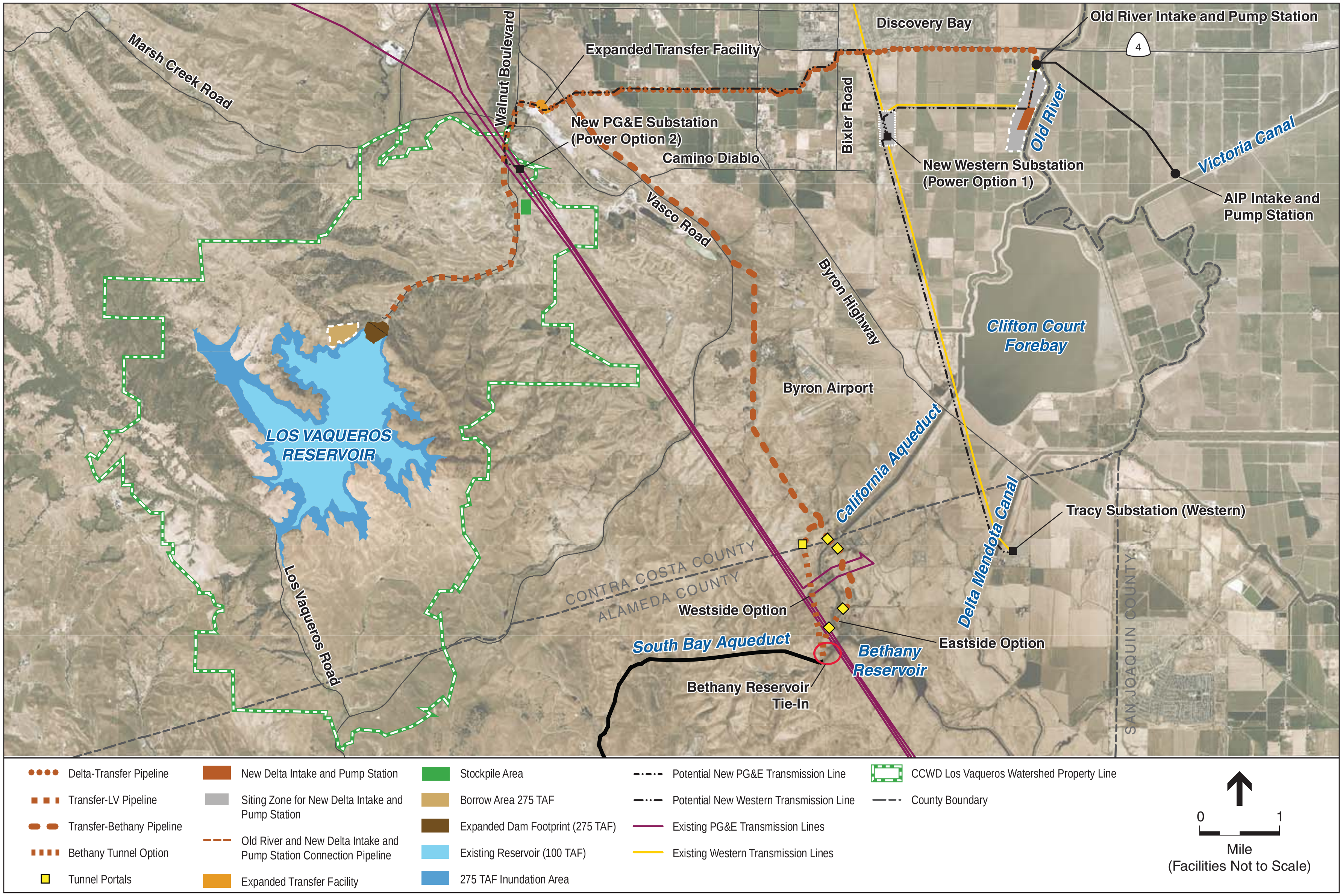
Key Features

- Expanded 275 TAF Reservoir
- Dual Emphasis on Environmental Water Management and Water Supply Reliability
- South Bay Connection of up to 470 cfs
- New Delta Intake Facility of up to 170 cfs
- Expanded Pipeline from Delta to Reservoir, to allow a total capacity of 670 cfs

Alternative 1 is designed to emphasize both of the primary objectives (environmental water management *and* water supply reliability improvement for the Bay Area) and include the largest number of potential beneficiaries of the reservoir expansion. This alternative would protect Delta fish through improved screening of diversions and coordinated operations with Reclamation's CVP system and DWR's SWP system. It would also include storage to improve water supply reliability and emergency water supplies for Bay Area water agencies. This alternative includes the largest proposed expansion of the reservoir, a new intake in the Delta, increased conveyance capacity from the Delta to the reservoir, and a South Bay Connection. Under Alternative 1, water would be moved through the expanded reservoir system into the SWP system at Bethany Reservoir, which serves all three South Bay water agencies (ACWD, and SCVWD, and Zone 7), and into San Luis Reservoir, which provides SCVWD its CVP contract water. **Figure ES-2** shows the existing and new facilities for Alternative 1.

Environmental Water Management

When operated in coordination with Reclamation's CVP system and DWR's SWP system, the expanded reservoir would be operated to divert and deliver a major portion of the South Bay water agencies' contracted state and federal system water through the expanded Los Vaqueros system and new South Bay Connection instead of through the existing SWP and CVP Delta export pumping facilities. These water system operations would improve Delta fish protection in the following ways:



SOURCE: USGS, 1993 (base map); and ESA, 2008

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Figure ES-2

Proposed Facilities – Alternatives 1 and 2

1. *Improved Fish Screening*. The expanded reservoir system would only divert water through state-of-the-art, positive barrier fish screens designed and operated to regulatory agency specifications. These fish screens would provide superior fish protection for the diversions to meet South Bay water agency needs. CVP and SWP Delta export pumping would be reduced to correspond with the use of the Los Vaqueros Reservoir pumping system for the South Bay water agencies. Shifting this water diversion to the more effectively screened Los Vaqueros Reservoir system intakes would have fewer impacts to fish than the same amount of water diverted from either the SWP or CVP export facilities. As analyzed in this EIS/EIR, this reduction takes place at the same time as the shift to Los Vaqueros Reservoir system intakes, but DWR, Reclamation and the state and federal fisheries agencies could optimize the timing of the reduction to further benefit fish. For example, the SWP and CVP Delta export pumps could be operated at minimal levels in April to improve salmon migration or to allow delta smelt larvae to move out of the South Delta, or they could be operated at minimal levels in February to allow longfin smelt larvae to move out of the South Delta. Initial estimates indicate that such operations could yield about 100 to 150 TAF of water per year to use in this manner.

2. *No-Diversion Period*. The additional storage also would provide operational flexibility to reduce or eliminate diversions into the expanded Los Vaqueros system during the most sensitive fish period without disrupting supplies. Current regulations for Los Vaqueros include a no-diversion period during the most critical spring fish period. During this period, water needs are met with stored water in Los Vaqueros Reservoir. Shifting the South Bay water agency diversion to the expanded Los Vaqueros system allows the application of this no-diversion period to approximately three times the current amount (existing CCWD diversions plus South Bay water agency diversions), while still making the water deliveries to the participating agencies.

3. *Multiple Delta Intake Locations*. Water would be diverted by the expanded Los Vaqueros system through three separate Delta intakes (Old River, AIP, and the new Delta Intake). Multiple points of diversion, coupled with additional storage capacity would enable coordination with CVP and SWP operations and pumping facilities to improve flexibility to respond to changing fishery conditions in the Delta to best protect fish.

Water Supply Reliability

The water delivery operations for Alternative 1 also provide three types of water supply reliability for Bay Area water agencies:

1. *Delta Supply Restoration*. Stored water supplies would be used to partially restore the delivery reductions to South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the SWP and CVP Delta export pumps. The state-of-the-art fish screen operations with multiple locations described above also could increase reliability for those agencies by making the deliveries less subject to the uncertainty associated with regulatory restrictions on the SWP and CVP Delta export pumps. With additional storage, demands can be met with releases from the reservoir even when Delta export diversions are curtailed to avoid sensitive fish periods and protect environmental resources.

2. *Dry Year Storage*. The additional storage would increase the amount of water available in dry years to South Bay water agencies and CCWD, reducing the need to purchase supplemental dry-year supplies.

3. *Emergency Storage*. Increased stored water supplies would be available for delivery to Bay Area water agencies through the South Bay Connection or existing interties in the event of a Delta levee failure or spill or other emergency.

Water Quality

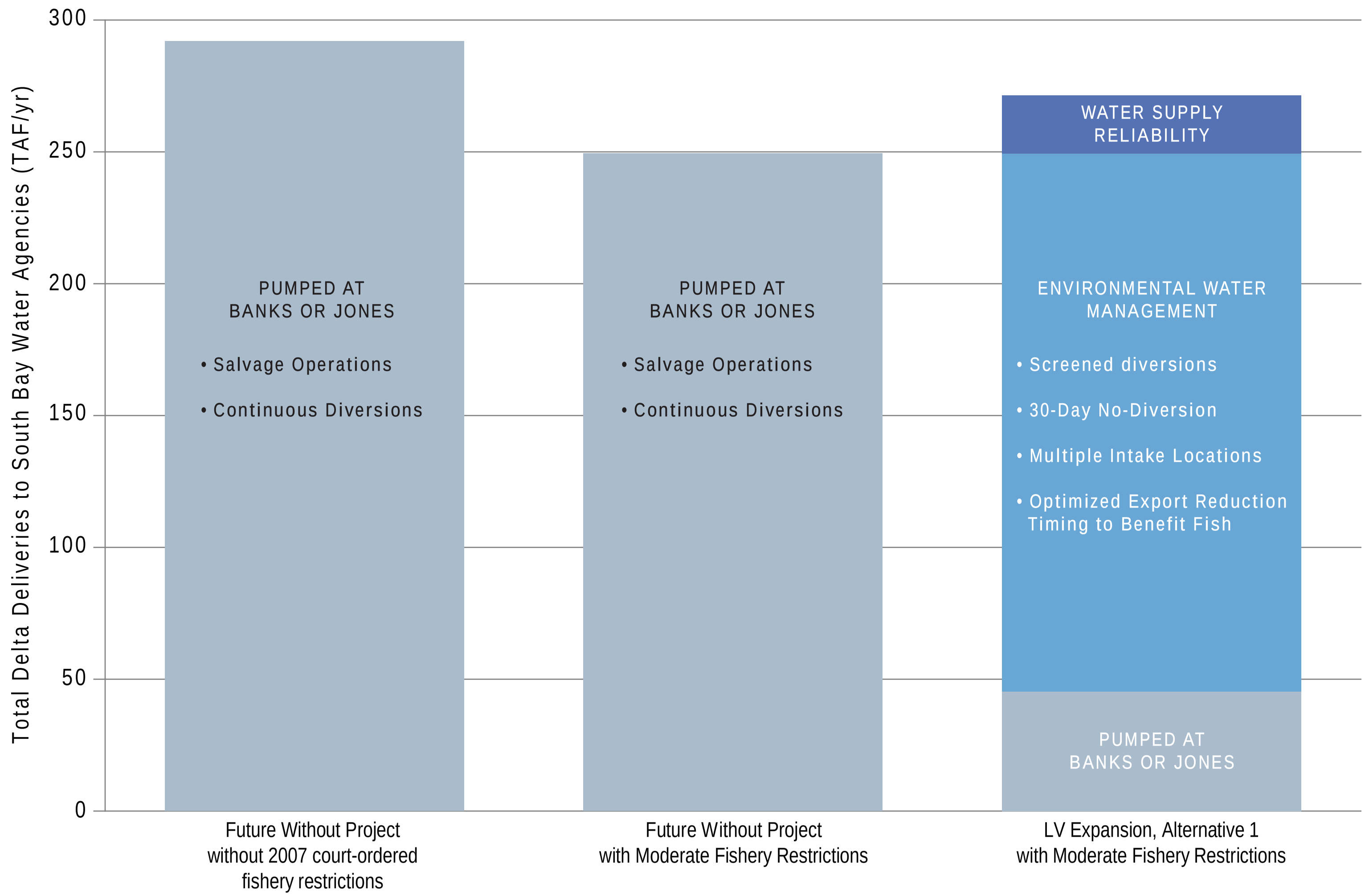
Alternative 1 would result in some water quality improvements with reduced salinity levels in dry periods and improvements in temperature and turbidity because a substantial portion of supplies to the SBA would no longer pass through Clifton Court Forebay. The expanded reservoir would also improve water quality for CCWD by providing a larger supply of high quality water stored in the reservoir to blend with Delta supplies in dry years.

Table ES-2 shows the potential improvements for environmental water management, Bay Area water supply reliability, and water quality for Alternative 1. **Figure ES-3** illustrates the environmental water management benefits and the water supply benefits for the South Bay water agencies graphically.

TABLE ES-2
ALTERNATIVE 1 – SUMMARY OF BENEFITS

Operations	Benefits[1]		
	Long-term Average Yield	6-Year Drought	
		Annual Average Yield	Total
Environmental Water Management[4]	205 TAF/year	135 TAF/year	820 TAF
South Bay Water Agencies Water Supply Reliability	20 TAF/year	30 TAF/year	170 TAF
CCWD Water Supply Reliability[2]	NA	3 TAF/year	20 TAF
Emergency Water Storage[3]	225 TAF	170 TAF	NA
Additional Real-time Operating Benefits	Multiple intake locations to further avoid fish impacts; increased water supply reliability by reducing regulatory pumping restrictions Timing of pumping reductions at SWP/CVP Delta export facilities to further benefit fish		
South Bay Water Agencies Water Quality	Incidental taste & odor improvements Incidental salinity improvements		
CCWD Water Quality	Incidental improvement in CCWD's ability to meet its delivered water quality goal		

1 Long-term average and 6-year drought values based on 2030 level of development, moderate fishery restrictions.
2 Assumes 20 TAF of additional storage for CCWD.
3 Average amount of water available in the reservoir for a single-year emergency.
4 Environmental Water Management in Alternative 1 includes screened intakes, a 30-day No-Diversion period, multiple intake locations, and possible optimization of export reduction timing to benefit Delta fish. See description in Section ES.3.2 for details on these operations and benefits.



SOURCE: CCWD, 2008

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Figure ES-3
Alternative 1 Benefits

Alternative 2: Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management Emphasis

Key Features

- Expanded 275 TAF Reservoir
- Environmental Water Management Emphasis
- South Bay Connection of up to 470 cfs
- New Delta Intake Facility of up to 170 cfs
- Expanded Pipeline from Delta to Reservoir, to allow a total capacity of 670 cfs

This alternative includes the same facilities as Alternative 1, but would be operated to maximize environmental water management improvements. The water delivery operations for this alternative were designed to identify the effects and benefits associated with using an expanded Los Vaqueros Reservoir primarily to improve environmental water management. This alternative results in some increases in water supply reliability for Bay Area water agencies, but not to the same extent as Alternative 1.

Environmental Water Management

The water system operations for Alternative 2 would also shift Delta diversions for South Bay water agencies to the expanded Los Vaqueros system, resulting in the same fish protection improvements as described for Alternative 1. In addition, Alternative 2 would use the expanded storage to provide additional dedicated environmental water supplies:

1. *Fish Protection*. The fish protection benefits would be achieved in the same manner and similar magnitude as Alternative 1 – shifting South Bay water agencies' Delta diversions to the expanded Los Vaqueros system provides improved fish screening, a no-diversion period, and multiple intake locations to better protect Delta fish.

2. *Dedicated Storage for Environmental Water*. The expanded Los Vaqueros system would dedicate storage capacity for environmental water thereby creating an additional long-term water supply asset reserved for environmental purposes. The new stored environmental water supply assets could be used by the resource agencies in several ways, including environmental water supplies for Central Valley refuges, in-stream flows, additional SWP/CVP Delta export pumping curtailment, or other environmental purposes. For example, water from the expanded Los Vaqueros Reservoir system could be transferred downstream to San Luis Reservoir where it would be available for delivery to San Joaquin Valley wildlife refuges. It could also be used directly or by exchange to reduce Delta diversions during fish sensitive periods, to reduce direct take at other diversions, or to provide river flows for fishery purposes.

Water Supply Reliability

This alternative would provide some water supply reliability for Bay Area water agencies:

1. *Dry Year Storage*. The additional storage would increase the amount of water available in dry years to CCWD, reducing the need to purchase supplemental dry-year supplies. This alternative would not provide dry year water supply reliability to South Bay water agencies.

2. *Emergency Storage*. As with Alternative 1, increased stored water supplies would be available in emergencies for delivery to Bay Area water agencies through the South Bay Connection or existing interties.

The state-of-the-art fish screen operations described above would increase reliability for South Bay water agencies by making the deliveries less subject to the uncertainty associated with regulatory restrictions on the SWP and CVP Delta export pumps. However, under Alternative 2, additional Delta Supply Restoration deliveries would not be provided to restore water supplies to the South Bay water agencies that have been reduced due to export pumping restrictions.

Water Quality

Alternative 2 would also result in modest water quality improvements with reduced salinity levels in dry periods and improvements in temperature and turbidity because a substantial portion of supplies to the SBA would no longer pass through Clifton Court Forebay. The expanded reservoir would also improve water quality for CCWD by providing a larger supply of high quality water stored in the reservoir to blend with Delta supplies in dry years.

New and expanded facilities to increase the storage capacity of Los Vaqueros Reservoir are shown on Figure ES-2. **Table ES-3** shows the range of potential improvements for environmental water management, Bay Area water supply reliability, and water quality for Alternative 2.

TABLE ES-3
ALTERNATIVE 2 – SUMMARY OF BENEFITS

	Benefits[1]		
		6-Year Drought	
Operations	**Long-term Average Yield**	**Annual Average Yield**	**Total**
Environmental Water Management[4]	245 TAF/year	190 TAF/year	1,140 TAF
CCWD Water Supply Reliability[2]	NA	3 TAF/year	20 TAF
Emergency Water Storage[3]	215 TAF	145 TAF	NA
Additional Real-time Operating Benefits	Multiple intake locations to further avoid fish impacts; increased water supply reliability by reducing regulatory pumping restrictions Timing of pumping reductions at SWP/CVP Delta export facilities to further benefit fish		
South Bay Water Agencies Water Quality	Incidental taste & odor improvements Incidental salinity improvements		
CCWD Water Quality	Incidental improvement in CCWD's ability to meet its delivered water quality goal		

1 Long-term average and 6-year drought values based on 2030 level of development, moderate fishery restrictions.
2 Assumes 20 TAF of additional storage for CCWD.
3 Average amount of water available in the reservoir for a single-year emergency.
4 Environmental Water Management in Alternative 2 includes screened intakes, a 30-day No-Diversion period, multiple intake locations, dedicated storage for environmental water, and possible optimization of export reduction timing to benefit Delta fish. See description in Section ES.3.2 for details on these operations and benefits.

Alternative 3: Expanded 275-TAF Reservoir, No South Bay Connection, Environmental Water Management Emphasis

Key Features

- Expanded 275 TAF Reservoir
- Environmental Water Emphasis
- No South Bay Connection
- Expand Existing CCWD Intake Facilities by 70 cfs
- Expanded Pipeline from Delta to Reservoir, to allow a total capacity of 570 cfs

Alternative 3 includes the 275 TAF expanded reservoir like Alternatives 1 and 2, but does not include a South Bay Connection to Bethany Reservoir. The water system operations for this alternative were designed to evaluate whether it would be possible to achieve the project objectives without constructing the South Bay Connection and the associated new Delta Intake and Pump Station. Alternative 3 water system operations emphasize the use of an expanded Los Vaqueros Reservoir to improve Environmental Water Management. **Figure ES-4** shows the existing and new facilities for Alternative 3.

Environmental Water Management

Because Alternative 3 would not include the South Bay Connection, CVP and SWP supplies would not be delivered to South Bay water agencies through the expanded Los Vaqueros Reservoir system and the associated fish protection benefits would not be achieved. Alternative 3 would be operated to achieve environmental water management improvements in two ways:

1. *No-Diversion Period*. CCWD would cease pumping from the Delta during the most critical fish period in the spring and instead rely on releases from the expanded Los Vaqueros Reservoir.

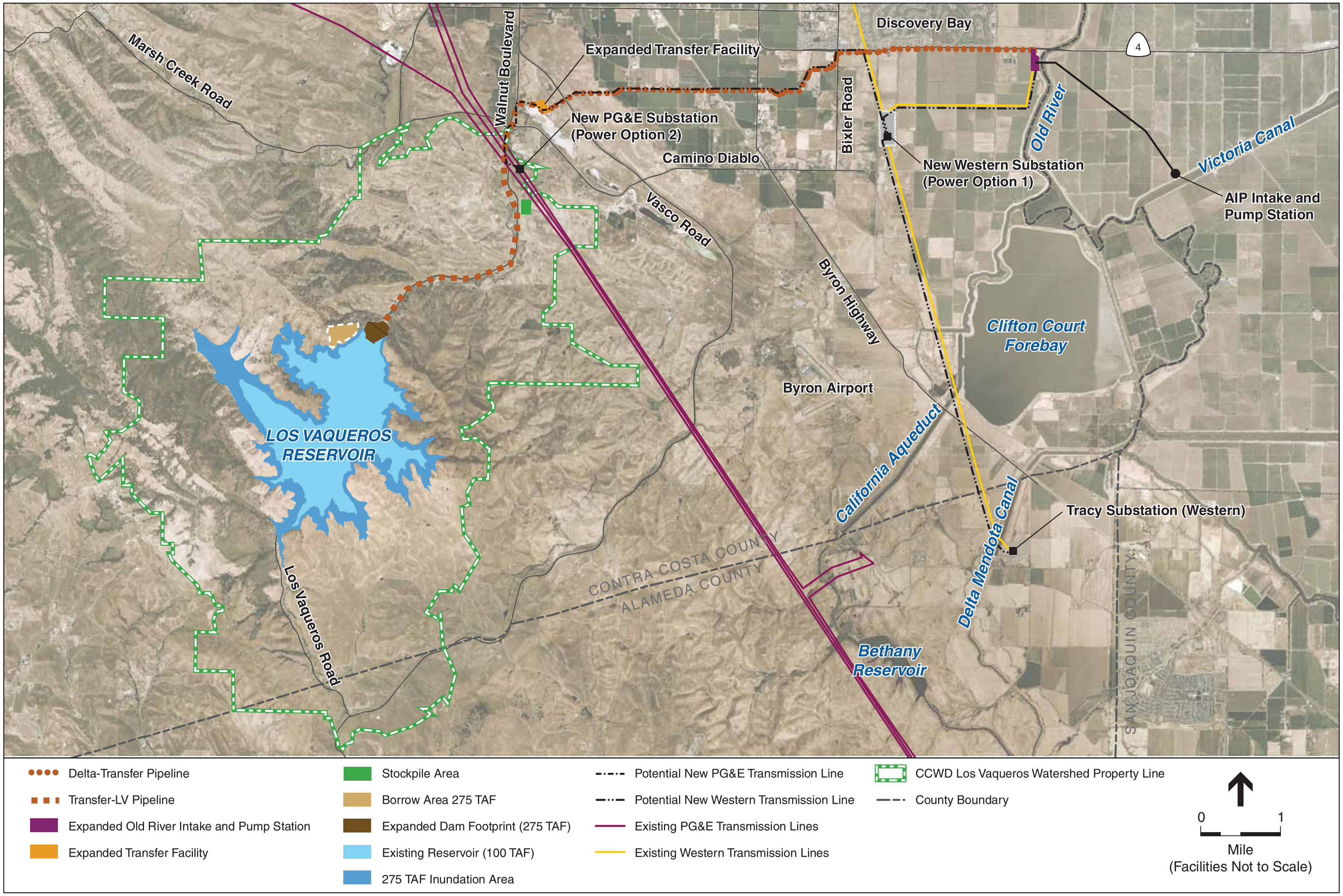
2. *Dedicated Storage for Environmental Water*. Additional stored water in the expanded reservoir would be reserved for environmental purposes. This could be accomplished through coordinated operations with Reclamation's CVP system. For example, when Reclamation has a need to retain cold water stored in upstream reservoirs, CCWD could refrain from pumping its CVP supply from the Delta and instead draw from the stored Los Vaqueros Reservoir supplies to serve its customers. The water stored upstream of the Delta in CVP reservoirs that had been reserved for delivery to CCWD could then be reallocated for environmental purposes, including cold water releases to support salmon spawning, pulse flow releases to support salmon migration, or water for wildlife refuges or other environmental purposes. The CVP water supply foregone by CCWD in this manner could also be conveyed through the Delta by existing export facilities for environmental purposes south of the Delta.

Water Supply Reliability

This alternative would provide water supply reliability improvements for CCWD and other Bay Area water agencies through existing interties or by exchange:

1. *Dry Year Storage*. The additional storage would increase the amount of water available in dry years to CCWD, reducing the need to purchase supplemental dry-year supplies.

2. *Emergency Storage*. Increased stored water supplies would be available in emergencies for delivery to Bay Area water agencies through existing interties or by exchange, but it would not be as flexible compared to alternatives with the South Bay Connection.



SOURCE: USGS, 1993 (base map); and ESA, 2008

Figure ES-4
Proposed Facilities – Alternative 3

Water Quality

With no South Bay Connection, the expanded reservoir would only improve water quality for CCWD. The water quality benefit to CCWD under Alternative 3 is estimated to be similar to that provided in Alternatives 1 and 2, based on an additional 20 TAF of dry year storage. CCWD could receive additional incidental water quality benefits under Alternative 3 if releases of the Dedicated Storage for Environmental Water are made to reduce CCWD diversion of Delta water at times when Delta salinity is high. Such operations would not necessarily occur at times of high Delta salinity, so they do not guarantee additional water quality benefit for CCWD.

Table ES-4 shows the range of potential improvements for environmental water management, Bay Area water supply reliability, and water quality for Alternative 3.

TABLE ES-4
ALTERNATIVE 3 – SUMMARY OF BENEFITS

Operations	Benefits[1]		
	Long-term Average Yield	6-Year Drought	
		Annual Average Yield	Total
Environmental Water Management[4]	20 TAF/year	65 TAF/year	385 TAF
CCWD Water Supply Reliability[2]	NA	3 TAF/year	20 TAF
Emergency Water Storage[3]	235 TAF	130 TAF	NA
CCWD Water Quality	Incidental improvement in CCWD's ability to meet its delivered water quality goal		

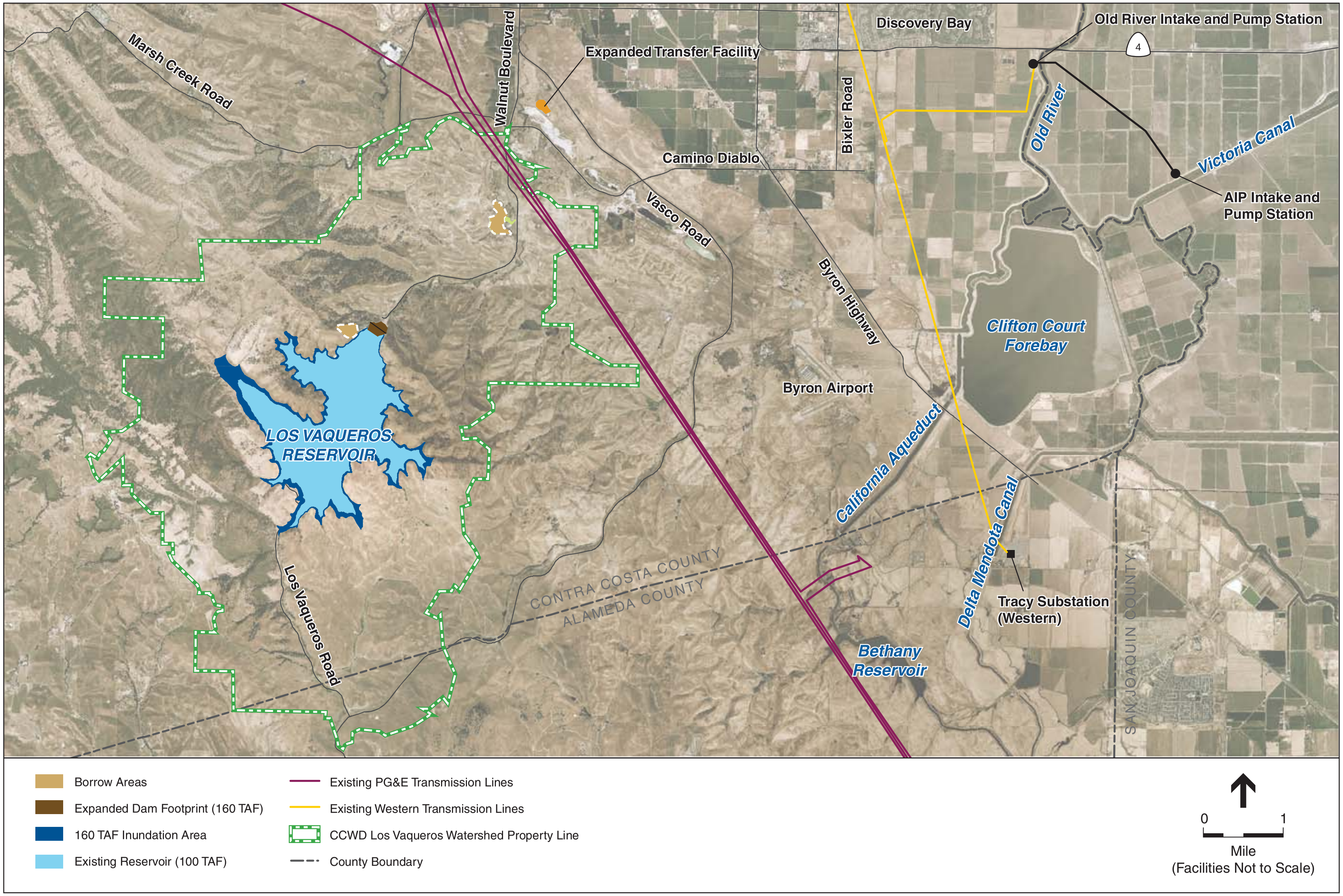
1 Long-term average and 6-year drought values based on 2030 level of development, moderate fishery restrictions.
2 Assumes 20 TAF of additional storage for CCWD.
3 Average amount of water available in the reservoir for a single-year emergency.
4 Environmental Water Management in Alternative 3 includes screened intakes, a 30-day No-Diversion period, and dedicated storage for environmental water. See description in Section ES.3.2 for details on these operations and benefits.

Alternative 4: Expanded 160-TAF Reservoir, No South Bay Connection, Water Supply Reliability Emphasis

Key Features

- Expanded 160 TAF Reservoir
- Water Supply Reliability Emphasis
- No South Bay Connection
- No change to Existing Intake Facilities
- No change to Pipeline from Delta to Reservoir

Alternative 4 includes a smaller reservoir expansion (from 100 TAF to 160 TAF) than Alternatives 1 through 3. No South Bay Connection connecting Los Vaqueros Reservoir to the South Bay water agencies would be constructed. There would be no changes to Delta intake facilities and no expansion of conveyance from the Delta to the reservoir. This alternative is included to evaluate the ability of a smaller reservoir expansion to improve water supply reliability for CCWD and participating Bay Area water agencies that could be served, directly or by exchange, through existing interconnections with CCWD. **Figure ES-5** shows the existing and new facilities for Alternative 4.



SOURCE: USDA, 2006; and ESA, 2008

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Figure ES-5
Proposed Facilities – Alternative 4

Environmental Water Management

Like Alternative 3, this alternative does not include a South Bay Connection, so CVP and SWP supplies could not be delivered directly to South Bay water agencies through the expanded Los Vaqueros Reservoir system and the associated fish protection benefits would not be achieved. Alternative 4 environmental water management improvements would result from water management flexibility at CCWD facilities:

1. *No-Diversion Period*. CCWD would cease pumping from the Delta during the most critical fish period in the spring and instead rely on releases from the expanded Los Vaqueros Reservoir.

Water Supply Reliability

This alternative would provide water supply reliability improvements for CCWD and other Bay Area water agencies through existing interties or by exchange:

1. *Dry Year Storage*. The additional storage would increase the amount of water available in dry years to CCWD and any other participating Bay Area water agencies, reducing the need to purchase supplemental dry-year supplies.

2. *Emergency Storage*. Increased stored water supplies would be available in emergencies for delivery to Bay Area water agencies through existing interties or by exchange.

Water Quality

With no connection to the South Bay water agencies, the expanded reservoir would only improve water quality for CCWD by providing a larger supply of high quality water stored in the reservoir to blend with Delta supplies in dry years.

Table ES-5 shows the range of potential improvements for environmental water management, Bay Area water supply reliability, and water quality for Alternative 4.

TABLE ES-5
ALTERNATIVE 4 – SUMMARY OF BENEFITS

Operations	Benefits[1]		
	Long-term Average Yield	6-Year Drought: Annual Average Yield	6-Year Drought: Total
Environmental Water Management[4]	NA	2 TAF/year	14 TAF
Water Supply Reliability[2]	NA	10 TAF/year	60 TAF
Emergency Water Storage[3]	120 TAF	80 TAF	NA
CCWD Water Quality	Percent of time that CCWD meets its delivered water quality goal increased by 5% (from 88% to 93%)		

1 Long-term average and 6-year drought values based on 2030 level of development, moderate fishery restrictions.
2 Assumes 60 TAF of additional storage for CCWD and any other participating Bay Area water agencies.
3 Average amount of water available in the reservoir for a single-year emergency.
4 Environmental Water Management in Alternative 4 includes screened intakes and a 30-day No-Diversion period. See description in Section ES.3.2 for details on these operations and benefits.

ES.4 Summary of Potential Environmental Impacts and Mitigation Measures

While the project alternatives are designed to provide benefits in the areas of fishery protection in the Delta, Bay Area water supply reliability and Bay Area drinking water quality, as described above, these alternatives also would result in some short-term and long-term impacts to the environment. **Table ES-7**, included at the end of this section, summarizes the environmental impacts associated with each of the project alternatives. For impacts determined to be significant, mitigation measures are presented and the impact significance after mitigation is shown. The environmental impacts associated with the project alternatives can be generally categorized as follows: project construction; facility siting / footprint; project operations; climate change; and growth-inducement.

ES.4.1 Construction

Most environmental impacts identified for the project alternatives would be associated with project construction; these impacts would occur for up to three years and would cease once project construction is completed. Construction impacts include effects associated with transport of construction materials and equipment and carrying out construction activities such as excavation, grading, foundation development, paving, and building of structures. Construction activities generate impacts such as noise, dust, indirect habitat disruption, temporary effects on agricultural activities, construction traffic and access disruption, increased erosion, or increased potential for spill of hazardous materials used in construction (such as fuel, or paint) and related water quality issues. In some cases, construction effects were found to be less than significant and in other cases they were determined to be significant. In all cases, feasible mitigation measures have been identified to reduce construction impacts to less than significant levels. There would be no significant and unavoidable construction impacts.

ES.4.2 Facility Siting / Footprint

Facility siting or footprint effects are the permanent effects that result from locating a facility on a specific site and removing or altering what was on the site previously. These types of impacts include conversion of farmland to non-agricultural uses, and effects on biological resources and habitats, cultural resources, visual resources, or other land uses as well as the potential for increased exposure to hazards. In some cases these types of impacts identified for the project alternatives were considered to be significant and in most cases, feasible mitigation measures were identified to reduce these significant effects to less than significant levels. Two footprint impacts were found to be significant and unavoidable: loss of important farmland and loss of a potential regional movement corridor for the San Joaquin kit fox.

Most of the significant footprint effects would be associated with expansion of the reservoir, which would result in adverse effects on biological and cultural resources.

Under Alternatives 1, 2 and 3 the reservoir would be expanded from 100 TAF to 275 TAF, which would increase the area of reservoir inundation by approximately 1,000 acres, from 1,500 acres to

2,500 acres. Under Alternative 4, reservoir expansion from 100 TAF to 160 TAF would inundate an additional 400 acres, increasing the area of inundation from 1,500 acres to 1,900 acres. The expanded reservoir would inundate existing habitat for biological resources, including various sensitive plant and animal species; inundation primarily would affect grassland habitat but also some oak woodland, scrub, and wetland habitats. The effects of reservoir expansion on biological resources would be mitigated to less than significant levels through implementation of a habitat compensation and enhancement program that would preserve, restore and enhance habitats of the type affected. However, one effect of reservoir expansion is considered significant and unavoidable, despite habitat mitigation. Reservoir expansion would inundate an area of grassland along the west side of the reservoir that could be used as a movement corridor by the San Joaquin kit fox, an endangered species. While there is no documented use of this grassland area by kit fox (surveys for kit fox activity within the Los Vaqueros Watershed were conducted prior to reservoir construction and have been conducted annually following reservoir completion since 1998). However, because it is suitable habitat for the kit fox, the grassland corridor along the west side of reservoir is considered to be a potential movement corridor and loss of much or all of this grassland due to reservoir inundation is, therefore, considered to be a significant and unavoidable impact of the project.

Dam modification and reservoir expansion would also affect cultural resources; mitigation measures have been identified to reduce these effects to less than significant levels. Relocation of existing recreation facilities and the addition of new recreation facilities proposed under all alternatives would result in relatively small footprint effects on habitats within the watershed. These effects would be reduced to less than significant levels through the habitat mitigation program.

Significant effects on agricultural resources would occur outside the watershed. Construction of the new Delta Intake and Pump Station, proposed under Alternatives 1 and 2, would result in loss of up to 22 acres of farmland that is designated as important farmland by the state. The entire area along Old River is designated as such, thus the impact to this farmland is unavoidable. Although this facility would occupy a relatively small amount of land, the impact on important farmland is considered significant and unavoidable.

Construction of new pipelines would result in only very limited footprint impacts. Pipelines would be buried and the surface area restored.

Under Alternative 4, use of the proposed borrow area to extract material for expanding the dam core could result in a permanent effect on the visual quality and character of the surrounding area in the lower Kellogg Valley but this effect would be mitigated to less than significant level through implementation of a site restoration plan.

ES.4.3 Project Operations

Project operation effects relate primarily to the proposed diversion of water from the Delta for delivery to the potential project participants: the South Bay water agencies and CCWD. By design, the project alternatives are intended to benefit Delta fishery resources. Therefore, impacts to Delta resources have been minimized as part of the design of the proposed project operations. The one exception is associated with project operations under Alternative 3. Under this alternative, additional water would be diverted through the expanded Los Vaqueros Reservoir system and, unlike conditions under Alternatives 1 and 2, this water diversion would not be offset by a commensurate reduction in Delta water diversion from the CVP and SWP Delta export pumps. Consequently, additional fish could be adversely affected by the increased Delta diversion. This would be a significant and unavoidable impact of Alternative 3. By contrast, Alternatives 1 and 2 would provide a substantial benefit for Delta fishery resources. Use of improved fish screens for diversion of water for South Bay water agencies would improve conditions for Delta fishery resources; benefits could be further increased through adaptive management of the timing of offsetting pumping reductions.

Also by design, water diversion operations under each of the project alternatives would not result in significant adverse effects on water supplies for other Delta water users.

Operation of individual project facilities within the expanded system would not result in significant long-term impacts such as noise, air quality pollutant emissions, or public safety risks.

ES.4.4 Climate Change

This Draft EIS/EIR examines the potential for the project alternatives to increase greenhouse gas emissions, which in turn would contribute to global climate change effects. As a global concern, increases in greenhouse gases contribute to cumulative impacts, rather than constituting a direct impact associated with a single project. This Draft EIS/EIR also reviews changes in water supply availability, sea level rise and the potential for increased flooding caused by climate change to assess how the project might affect or be affected by these environmental changes.

Project construction and operation would result in increased greenhouse gas emissions. Construction emissions would be short-term, ceasing after three years upon project completion. Greenhouse gas emissions associated with project operation would result primarily from the purchase and use of additional electrical energy to support water diversion and delivery pumping through the expanded Los Vaqueros Reservoir system. Under Alternatives 1 and 2, the increase in water diversion and delivery pumping proposed under the project would be partially offset by reductions in water pumping elsewhere, specifically through the state and/or federal Delta water export systems. The project alternatives would not conflict with any measures adopted by the state or other agencies to implement the California Global Warming Solutions Act of 2006 (AB 32), the state law that requires the Air Resources Board to design and implement measures to reduce greenhouse gas emissions to 1990 levels by 2020. Further, the project alternatives include the following features designed to minimize energy consumption and greenhouse gas emissions: on-site borrow areas to supply dam construction materials; local acquisition of construction materials; efficient pumping facilities; incorporation of solar panels in the roof of the Marina Complex and new interpretive center; in-system energy recovery in the Transfer-Bethany Pipeline; and use of CCWD’s low emission, fuel efficient vehicle fleet. The Draft EIS/EIR finds that the project would not result in a cumulatively considerable increase in greenhouse gas emissions.

With respect to the potential effects of climate change, the project increases the flexibility of local and regional water supply systems to adapt to changes in water supply availability. Increasing water storage capacity and flexibility to adjust the timing and location of water diversion from the Delta improves the ability of local, regional and state water managers to adjust water supply operations to respond to potential changes in water supply availability as well as to respond to changing environmental conditions in the Delta.

ES.4.5 Growth-Inducement

None of the project alternatives would be directly growth inducing. The project alternatives are designed to improve water supply reliability for select Bay Area water agencies. Alternative 1 is designed to provide the greatest level of water supply reliability for the South Bay water agencies. This alternative would restore an increment of Delta water supply deliveries that the South Bay water agencies previously anticipated receiving in the future but would not receive because of court-ordered restrictions imposed in 2007. These restrictions reduce the delivery reliability of both the CVP and SWP Delta export systems.

While each of the project alternatives would improve water supply reliability for CCWD and/or the South Bay water agencies, none would provide a substantial new or additional source of supply. Each of these agencies has prepared a long-term future water supply plan; Delta water supply is a central component in each. These long-term water supply plans have been designed to provide adequate water supply to meet the needs of both existing customers and the growth that has been planned in each service area by the respective city and county land use agencies. The potential environmental effects of this future planned growth have been evaluated and fully disclosed previously in the CEQA environmental documents prepared on the long-term water supply plans for CCWD and the South Bay water agencies.

ES.4.6 Significant and Unavoidable Impacts

As shown in Table ES-7, all action alternatives (Alternatives 1, 2, 3, and 4) would result in the following significant and unavoidable impacts:

- Loss of grassland area along the west side of the reservoir that is a potential (although undocumented) movement corridor for the endangered San Joaquin kit fox.

Alternatives 1 and 2 would result in the following additional significant and unavoidable impact:

- Loss of up to 22 acres of important farmland as designated by the state. This is both a direct project impact and a cumulative effect of the project.

Alternative 3 would result in the following additional significant and unavoidable impact:

- Increased adverse impact of Delta fishery resources due to increased water diversion from the Delta. This is both a direct project impact and a cumulative effect of the project.

Mitigation has been included where feasible to reduce these direct, indirect, and cumulative impacts but would not be sufficient to reduce them to a less-than-significant level.

ES.5 Issues of Known of Controversy and Issues to be Resolved

ES.5.1 Issues of Known Controversy

Based on public and agency comments received throughout the project planning process, Reclamation and CCWD have identified the following areas of controversy related to the proposed expansion of Los Vaqueros Reservoir. Appendix A-1, Scoping Report, summarizes all of the issues raised by agencies and the public during the public scoping process in December 2006 through February 2006.

Delta Sustainability

As described above, the Delta is critically important to the health of California's economy and environment. Conflicts and controversy have defined water operations in the Delta for decades. Significant efforts are underway to identify plans and operations for a sustainable Delta in the future. The expansion of Los Vaqueros Reservoir can be a near-term action to alleviate some of the conflict and controversy regarding water diversions and environmental protection. The reservoir expansion project can also be coordinated with the long-term solutions as they are developed. For any reasonably foreseeable solutions, the reservoir expansion enhances the flexibility and benefits.

Delta Fisheries

The health and sustainability of Delta fisheries populations and habitat has been of high concern with recent species decline. The benefits and effects of the reservoir expansion project for Delta fisheries are described in this Draft EIS/EIR.

Water Supply

The reliability of water supplies from the Delta is highly important for Bay Area water agencies, particularly in light of recent court orders and regulatory changes affecting Delta exporting pumping.

Other Environmental Effects

The following potential environmental effects of the reservoir expansion and any necessary mitigation are of interest and concern to agencies and the public. These issues are evaluated and addressed in this Draft EIS/EIR:

- **Delta Hydrology and Water Quality** – The potential effects on Delta hydrology, water quality, and water operations, including the cumulative effects of Delta diversions and operations.
- **Terrestrial Impacts** – The potential terrestrial species and habitats effects of the increased reservoir inundation area and new or expanded intakes and conveyance facilities

- **Cultural/Historical Resources** – The effects on important cultural resources in and around the Los Vaqueros Watershed.

- **Recreation** – The equivalent replacement and enhancement of recreational resources in the Los Vaqueros Watershed is an important public issue and commitment by the CCWD Board of Directors.

ES.5.2 Issues to be Resolved

Reclamation and CCWD will need to identify a preferred alternative. The decision will be based on project benefits, potential environmental effects, and numerous factors including the type of financing available, permitting requirements, and implementation schedule. Other issues to be resolved include:

- Further discussion and negotiation is necessary to determine the level of participation by other beneficiaries. These discussions would lead to agreements among all participants on project benefits and financial participation.

- The CCWD Board of Directors will be reviewing the alternatives to determine the ability to meet the principles the Board established for participation in the reservoir expansion.

- The selection of an alternative will determine the overall project benefits for the environment, Bay Area water supply reliability and water quality. Project design and operations will also be refined through the environmental permitting process, in particular compliance with the federal and state Endangered Species Acts, which will also affect the overall project benefits. The selection of an alternative also determines the level and type of environmental impacts, as described in this Draft EIS/EIR.

- Regardless of which alternative is selected for implementation, detailed design of project features and planning of construction will need to be coordinated with mitigation requirements so that sensitive resources in the project areas are avoided where practicable. The methods for achieving required mitigation would be determined during detailed project design through consultation and coordination with the permitting agencies.

- Completion and conclusions of the Federal Feasibility Report including related engineering design, economic (costs and benefits), and financial analyses as a basis for determining the type and extent of federal interest in project implementation.

- Completion and conclusions of the State Feasibility Report as a basis for determining the type and extent of state interest in project implementation.

- Completion and conclusions of public review of this Draft EIS/EIR and the subsequent Final EIS/EIR as a basis for determining mitigation commitments, the Environmentally Superior Alternative per CEQA, and the LEDPA per Clean Water Act (CWA), Section 404(b)(1).

ES.6 Relationship to Environmental Protection Statutes, Plans, and Other Requirements

This Draft EIS/EIR has been prepared in consideration of NEPA, CEQA, and other pertinent federal, state, and local environmental regulations. NEPA requires that environmental consequences of a Proposed Action and project alternatives be considered before the decision making for implementation of a federal project. CEQA requires that environmental consequences of a Proposed Project and project alternatives be considered before approval, financing, or participation by the lead agency pursuant to CEQA. Chapter 7 of this Draft EIS/EIR presents the applicable environmental laws, regulations, and alternative plans being considered and the intended uses and users of the document. This Draft EIS/EIR is not a decision document and is not serving as public notice for any permit actions.

Table ES-6 summarizes the status of consultation for the requirements that must be met by Reclamation and CCWD before the Los Vaqueros Reservoir Expansion Project can be built and operation of facilities implemented.

ES.7 Public Involvement and Next Steps

During the Public Scoping process, CCWD met with potentially interested agencies and stakeholders from January through June 2006 to provide an overview of the proposed project alternatives and solicit their input. The objective of this effort was to obtain public input about issues as early as possible in the environmental review process.

Outreach activities have included continuous coordination with and input from public agencies including DWR, USFWS, CDFG, NMFS, and local Bay Area water agencies through regularly held ACWG meetings and additional briefings. CCWD has presented at various CALFED-related public meetings including environmental justice workshops and tribal forums. Meetings have been held with agency staff working as part of multi-agency CALFED workgroups, as well as staff working only for their respective agencies on non-CALFED-related activities. CCWD regularly participates in the CALFED Bay-Delta Public Advisory Committee, Water Supply Subcommittee together with representatives from Reclamation, DWR, CALFED Bay-Delta Authority, statewide water agencies, and stakeholders.

In accordance with CEQA and NEPA review requirements, this Draft EIS/EIR will be circulated for public and agency review and comment for a 60-day period following the date when the U.S. Environmental Protection Agency publishes the Notice of Availability of Weekly Receipt of Environmental Impact Statements in the Federal Register, and the filing of the Notice of Completion with the California State Clearinghouse. Five public hearings have been scheduled in Concord, Dublin, Livermore, Oakley, and Sacramento to receive public input on the Draft EIS/EIR. These hearings will be held during the public review and comment period so that any comments received at the hearings can be addressed in the Final EIS/EIR. In addition, written comments from the public, reviewing agencies, and stakeholders will be accepted during the public comment period.

TABLE ES-6
SUMMARY OF ENVIRONMENTAL COMPLIANCE FOR THE PROPOSED PROJECT

Requirements	Status of Compliance/Expected Completion
National Environmental Policy Act	Ongoing until this EIS/EIR Record of Decision published.
California Environmental Quality Act	Ongoing until this EIS/EIR document certified and mitigation met.
Federal Endangered Species Act and California Endangered Species Act	Ongoing until project Biological Opinion issued (see Sec. 4.6 Biological Resources).
Magnuson-Stevens Fishery Conservation and Management Act	Ongoing until project Biological Opinion issued (see Sec. 4.3 Delta Fisheries and Aquatic Resources).
Fish and Wildlife Coordination Act	Ongoing until Fish and Wildlife Coordination Act Report issued (see Sections 4.3 Delta Fisheries and Aquatic Resources and 4.6 Biological Resources).
Clean Water Act Section 401	CCWD will apply for Water Quality Certification after EIS/EIR is approved and project design underway (see Sec. 4.5 Local Hydrology, Drainage, and Groundwater).
Clean Water Act Section 404	CCWD will apply for Wetland Permit after the EIS/EIR is approved and project design underway (see Sec. 4.6 Biological Resources).
Clean Air Act	In compliance. Conformity analysis is not required. (see Sec. 4.10 Air Quality).
National Historic Preservation Act and Native American Consultation	Ongoing. Once Section 106 review process is completed, the project will proceed in accordance with conditions stipulated in the agreement with the State Historic Preservation Officer and appropriate agencies (see Section 4.16 Cultural and Paleontological Resources).
Executive Order 11988 - Floodplain Management	Ongoing. The project complies by using this EIS/EIR to identify and assess project effects (see Section 4.5 Local Hydrology, Drainage, and Groundwater).
Executive Order 11990 - Protection of Wetlands	CCWD will apply for Wetland Permit after the EIS/EIR is approved and project design underway (see Sec. 4.6 Biological Resources).
Executive Order 12898 - Environmental Justice	In compliance based on EIS/EIR Sec. 4.18 Environmental Justice.
Migratory Bird Treaty Act	Reclamation and CCWD will comply with provisions of the Migratory Bird Treaty Act (see Sec.4.6 Biological Resources).
California Fish and Game Code (Section 1600 Lake or Streambed Alteration Agreement Program)	Ongoing. The project complies with Section 1600 by using this EIS/EIR to identify and address expected project effects (Sec. 4.6 Biological Resources).
Caltrans Encroachment Permit	As needed, CCWD will apply for a Caltrans Encroachment Permit to construct within Caltrans right-of-way prior to construction (see Sec. 4.9 Transportation and Circulation).
Disabilities Regulations - Americans with Disabilities Act, Rehabilitation Act, and Architectural Barriers Act	Project will adhere to the construction guidelines of the Uniform Federal Accessibility Standards and comply with regulations proposed for incorporation into the Americans With Disabilities Act Accessibility Guidelines as a part of design for individual facilities.
Farmland Protection Policy Act	Ongoing. (see 4.8 Agriculture).
Section 10 of the Rivers and Harbors Act of 1899	Ongoing. This regulation is addressed in coordination with wetlands regulations (see Clean Water Act, Section 404, above).
NPDES Construction Stormwater Permit	CCWD will comply by preparing and using a Storm Water Pollution Prevention Plan at the time of construction (see Sec. 4.5 Local Hydrology, Drainage and Groundwater).
General Order for Dewatering and Other Low Threat Discharge to Surface Waters	CCWD will comply by preparing and using a permit at the time of construction (see Sec. 4.5 Local Hydrology, Drainage and Groundwater).

A Final EIS/EIR that will include responses to all comments will be prepared and circulated in accordance with NEPA and CEQA requirements. The Final EIS/EIR will be circulated for 30 days prior to taking action on the project and issuance of a ROD.

CCWD Decision Making Process

Following lead agency (Reclamation and CCWD) consideration of all comments received during public review of the Draft EIS/EIR and circulation of the Final EIS/EIR, the CCWD Board of Directors will hold a public meeting to consider certification of the Final EIR and to decide whether to approve the Proposed Action or an alternative. A Notice of Determination documenting the decision will then be issued. To support a decision on the project, the CCWD Board of Directors must prepare and adopt written findings of fact for each significant environmental impact identified in the Final EIS/EIR; a Statement of Overriding Considerations, if needed; and a Mitigation Monitoring and Reporting Program to ensure implementation of the mitigation measures and project revisions, if any, identified in the Final EIS/EIR.

The EIS/EIR is intended to be used by the CCWD Board of Directors when considering approval of the project. The CCWD Board of Directors will use the Final EIS/EIR to consider approval of the entire project. If necessary CCWD will use the Final EIS/EIR to petition the State Water Resources Control Board for water rights changes.

Federal Decision Making Process

Federal decision making will be based on the information contained in the Federal Feasibility Report, in compliance with the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (federal P&Gs), and information analyzed in compliance with NEPA (U.S. Water Resources Council, 1983). These documents will present the results of the feasibility study authorized by Public Law 108-7 and reaffirmed by Public Law 108-361.

Integral to the federal decision process are other legally required processes and information, such as biological opinions from the Federal Endangered Species Act consultation process and permits required by federal, state and local laws. The federal decision process also includes consideration of input from other federal, state, and local agencies, concerned stakeholders, tribes, and the general public.

The final federal decision is documented in a ROD. The ROD will address the decision and the alternatives considered; the alternative(s) considered to be environmentally preferable; the factors that were considered; whether or not all practicable means to avoid or minimize environmental harm for the alternative selected have been adopted, and if not, why; any monitoring and enforcement program established to ensure identified mitigation measures are accomplished; and any significant comments received on the Final EIS/EIR.

Reclamation. Reclamation is the federal lead agency, as delegated by the Secretary of the Interior, and therefore is responsible for the preparation and processing of the Federal Feasibility

Report and EIS. For efficiency, the EIS has been combined with an EIR, prepared by CCWD for compliance with the CEQA.

While the NEPA compliance process is a subset of the federal feasibility study process, there are important distinctions to make. The purpose of the NEPA process is to analyze and disclose the impacts of a range of alternatives, and to provide an opportunity for public review and comment prior to the final federal decision. The purpose of a Federal Feasibility Report is to address engineering, economic, environmental and financial aspects of alternatives, determine the potential benefits and costs, and determine if there is a federal interest in the implementation of a project.

Upon completion of the Final Federal Feasibility Report and the Final EIS/EIR, Reclamation's Mid-Pacific Regional Director will make a recommendation that will be submitted to the Commissioner of Reclamation for consideration. Then, the Commissioner will concur or modify the recommendation and forward the Final Federal Feasibility Report, Final EIS/EIR, and Draft ROD to the Secretary of the Interior.

Secretary of the Interior. The Secretary will review the Federal Feasibility Report and sign the ROD if he concurs with the recommendation and then send the Final Federal Feasibility Report, Final EIS/EIR, and signed ROD to Office of Management and Budget (OMB) for review.

OMB. In accordance with Executive Order 12322, OMB will review the Federal Feasibility Report for consistency with the policy and programs of the President, the federal P&Gs, and other applicable laws, regulations and requirements relevant to the federal planning process.

Congress. Congress will review the information provided by the Secretary and OMB, and then decide whether to authorize the recommended project. Congress is responsible for authorizing projects for construction and providing appropriations to construct projects.

Other Uses and Users of the EIS/EIR

Western will use the Final EIS/EIR to evaluate the environmental effects of approving provision of additional power supply to the new/expanded facilities – including construction and operation of new facilities and sale of additional energy supply to CCWD. Other cooperating, responsible and participating agencies will use the Final EIS/EIR when taking actions on the project including decisions to participate in the project, issuance of permits, and regulatory approvals.

TABLE ES-7
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.2: Delta Hydrology and Water Quality				
4.2.1: The project alternatives would not adversely alter deliveries of water to other users.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.2.2: The project alternatives would not result in significant adverse changes in Delta water quality causing the violation of a water quality standard.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.2.3: The project alternatives would not result in changes to Delta water quality that would result in significant adverse effects on beneficial uses.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.2.4: Diversions of Delta water under the project alternatives would not result in a significant reduction of Delta water levels.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.2.5: The project alternatives would not result in a cumulatively considerable contribution to significant adverse cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.3: Delta Fisheries and Aquatic Resources				
4.3.1: In-channel construction activities associated with the proposed new Delta Intake structure would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Old River, which would increase exposure of various life stages and species of fish to temporarily degraded water quality conditions.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM NI NI	**Implementation of Hazardous Materials Mitigation Measure 4.13.2:** This mitigation measure involves implementation of best management practices to keep hazardous materials from accidental release. See Section 4.13 for description of this measure. **Implementation of Hydrology Mitigation Measure 4.5.1a:** This mitigation measure involves implementation of a storm water pollution prevention plan. See Section 4.5 for description of this measure.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.3: Delta Fisheries and Aquatic Resources (continued)				
(4.3.1 continued)			**Measure 4.3.1:** To minimize sediment, turbidity, and contaminants in Old River during construction of the new Delta Intake (primarily excavation and cofferdam installation), CCWD or its contractors will obtain and comply with RWQCB Section 401 water quality certification, CDFG streambed alteration agreement, USACE Clean Water Act Section 404 permit, as needed, and adhere to the following requirements: • Monitor periods of construction activity and coordinate with the contractor to identify periods when localized increases in turbidity may occur. • Install a silt curtain to reduce the dissipation of suspended sediments during dredging and cofferdam installation. • Ensure that cofferdam(s) installation occurs during the designated construction window of August 1 through November 30 to avoid the potential risk of adverse impacts on chinook salmon, steelhead, delta smelt, and other aquatic species which are more abundant in the area during fall, winter, and spring. This construction window may be shifted through consultation with USFWS, NMFS, and CDFG if the best available fish survey data indicate that a different construction window for cofferdam installation will avoid or minimize effects on special-status species. • Minimize substrate disturbance during construction activities. • Ensure project construction activities will not cause significant turbidity increases in surface waters, as follows: - Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTU), increases will not exceed 1 NTU. - Where natural turbidity is between 5 and 50 NTU, increases will not exceed 20 percent. - Where natural turbidity is between 50 and 100 NTU, increase will not exceed 10 NTU. - Where natural turbidity is greater than 100 NTU, increases will not exceed 10 percent. • These limits will be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.3: Delta Fisheries and Aquatic Resources (continued)				
(4.3.1 continued)			periods may be applied, provided that Delta fisheries and aquatic resources would be fully protected. • Ensure project construction activities will not cause settleable matter to exceed 0.1 milliliters per liter in surface waters, as measured in surface waters 300 feet downstream from the project. • In the event that project construction activities create a visible plume in surface waters, initiate monitoring of turbidity levels at the discharge site and 300 feet downstream, taking grab samples for analysis of NTU levels twice per day during the work period while the visible plume persists. • Notify the RWQCB, CDFG, USFWS, and NMFS if the above criteria for turbidity are exceeded. • Notify the RWQCB, CDFG, USFWS, and NMFS of any spill of petroleum products, oil/grease, or other organic or earthen materials. • If the required permits from RWQCB, CDFG, USFWS or NMFS include conditions equivalent to any mitigation measure set forth above, substitute the permit condition for the equivalent mitigation measure.	
4.3.2: Underwater sound-pressure levels generated during cofferdam installation for the new Delta Intake could result in behavioral avoidance or migration delays for special-status fish species.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM NI NI	**Measure 4.3.2:** As discussed in Mitigation Measure 4.3.1, construction of the cofferdam for the new Delta Intake will be limited to the seasonal period between August 1 and November 30. This measure will also help avoid potential impacts to special-status fish species due to underwater sound pressure levels generated during coffer dam installation. To further reduce and avoid impacts to resident fish present in the south Delta in the immediate vicinity, the cofferdam would be installed using a vibration hammer that minimizes underwater sound pressure levels. If it is determined that a higher intensity percussion hammer would be required for installing the cofferdam, underwater sound pressure level monitoring would be performed by an acoustic expert to document sound pressure levels during cofferdam construction. Limiting construction related underwater sound pressure levels during cofferdam installation to less than 160 dB would reduce potential fishery impacts to a less-than-significant level. If monitoring indicates higher sound pressure levels than 160 dB, in-water construction activity would be suspended and avoidance of potential adverse effects would be achieved by consulting with USFWS, NMFS, and CDFG to determine and implement the appropriate actions, which would include one or more of the following:	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.3: Delta Fisheries and Aquatic Resources (continued)				
(4.3.2 continued)			• Surveying Old River at the intake site to determine fish presence before installation, and modifying the work window accordingly; • Use of an air bubble curtain to deflect and absorb sound pressure; • Use of lower intensity underwater sounds to repel fish from the immediate construction area before use of a high-pressure hammer; • Limiting the duration and frequency of high-pressure underwater sound levels during cofferdam installation.	
4.3.3: Dewatering of the cofferdam for the new Delta Intake could result in stranding of fish.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM NI NI	**Measure 4.3.3:** As discussed in Mitigation Measure 4.3.1, construction of the cofferdam for the new Delta Intake will be limited to the seasonal period between August 1 and November 30. This measure will also help avoid potential impacts to special-status fish species due to coffer dam dewatering. Additionally, CCWD will implement a fish rescue plan acceptable to CDFG, USFWS, and NMFS. CCWD shall ensure that a qualified fishery biologist designs and conducts the fish rescue and relocation effort to collect fish (all species) from the area behind the cofferdam. The fish rescue would be implemented during the dewatering of the area behind the cofferdam for the new Delta Intake and would involve capturing and relocating the fish to suitable habitat within Old River. To ensure compliance, a fisheries biologist shall be present onsite during initial dewatering activities. CCWD shall monitor progress of installation of the cofferdam and the schedule for dewatering. CCWD shall coordinate the dewatering schedule with the construction contractor and fishery biologist to allow for the fish rescue to occur before completely closing the cofferdam, and again during dewatering when water is about 2 feet deep at the shallowest point within the cofferdam. USFWS, NMFS, and CDFG shall be notified at least 48 hours before the fish rescue. Information on the species and sizes of fish collected in the rescue and estimates of survival just before release would be recorded during the time of the fish rescue and provided in a letter report to be submitted within 30 days after the fish rescue to USFWS, NMFS, and CDFG.	No Impact Less Than Significant
4.3.4: The new Delta Intake structure and associated fish screens in Old River would physically exclude fish from a small area of existing aquatic habitat and modify existing aquatic habitat.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM NI NI	**Implementation of Biological Resources Mitigation Measure 4.6.2b:** This mitigation measure provides for compensatory mitigation for the permanent impacts to habitat. See Section 4.6 for description of this measure.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.3: Delta Fisheries and Aquatic Resources (continued)				
4.3.5: The new Delta Intake structure and associated fish screens in Old River would modify hydraulic conditions next to the intake structure, but would not disorient special-status fish or attract predatory fish.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS NI NI	None Required.	No Impact Less Than Significant
4.3.6: Operation of the project alternatives would not result in changes to Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required.	No Impact Less Than Significant
4.3.7: Operation of the new screened intake, or changes to diversions at existing intakes, could affect direct entrainment or impingement of fish.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI B B SU LS	None Required.	No Impact Beneficial Significant & Unavoidable Less Than Significant
4.3.8: Fish screen maintenance activities would not significantly increase fish entrainment at the new Delta Intake or the expanded Old River Intake.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS NI	None Required.	No Impact Less Than Significant
4.3.9: The project, when combined with other planned project alternatives, or projects under construction in the area, could cumulatively contribute to substantial adverse impacts to Delta fisheries and aquatic resources.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM SU LS	**Mitigation for Cumulative Impacts:** Implementation of Delta Fisheries and Aquatic Resources Mitigation Measures (Measures 4.3.1, 4.3.2 and 4.3.3), together with Hazardous Materials Mitigation Measure 4.13.2, Hydrology Mitigation Measure 4.5-1a and Biological Resources Mitigation Measure 4.6.2b, will reduce potential impacts to less-than-significant levels. No additional measures will be required.	No Impact Less Than Significant Significant & Unavoidable
Section 4.4: Geology, Soils and Seismicity				
4.4.1: The project facilities would be designed and engineered in accordance with seismic code requirements. As a result, the project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking or seismic-related ground failure, including liquefaction and landslides.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.4: Geology, Soils and Seismicity (continued)				
4.4.2: During construction and operations, the project could result in substantial soil erosion or the loss of topsoil.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Implementation of Hydrology Mitigation Measures** (Measures 4.5.1a and 4.5.1b) and Biological Resources Mitigation Measures (Measures 4.6.2a and 4.6.2b) would reduce potential impacts of soil erosion and topsoil loss to a less-than-significant level. No additional measures would be required.	No Impact Less Than Significant
4.4.3: Project components could be located on expansive or corrosive soils or on a geologic unit or soil that is unstable or could become unstable as a result of the project or construction activities; however, those components would not likely result in onsite or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse, and would not create substantial risks to life or property.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.4.4: The proposed project would not make a cumulatively considerable contribution to cumulative effects associated with erosion, topsoil loss or increased exposure to seismic or other geohazard risks.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.5: Local Hydrology, Drainage and Water Quality				
4.5.1: During construction, the project alternatives could violate water quality standards through increased erosion and sedimentation to local waterways, release of fuels or other hazardous materials during construction, or dewatering of excavated areas that could result in substantial water quality degradation.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.5.1a:** CCWD shall ensure that a Storm Water Pollution Prevention Plan (SWPPP) is prepared in accordance with the requirements of the RWQCB's NPDES General Construction Permit requirements. The SWPPP will be designed to identify and control pollutant sources that could affect the quality of stormwater discharges from the construction sites through the development of best management practices (BMPs). BMPs will include those that effectively target pollutants in stormwater discharges to prevent or minimize the introduction of contaminants into surface waters. To protect receiving water quality, the BMPs will include, but are not limited to, the following: • Temporary erosion control measures (fiber rolls, staked straw bales, detention basins, check dams, geofabric, sandbag dikes, or temporary revegetation or other ground cover) will be employed for disturbed areas.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.5: Local Hydrology, Drainage and Water Quality (continued)				
(4.5.1 continued)			• No disturbed surfaces will be left without erosion control measures in place during the winter and spring months. • Sediment will be retained onsite by a system of sediment basins, traps, or other appropriate measures. • The construction contractor will prepare standard operating procedures for the handling of hazardous materials on the construction site to prevent discharge of materials to stream or storm drains. This will include the contractor establishing specific fueling areas for construction vehicles and equipment located at least 200 feet from drainages. Grading areas must be clearly marked and equipment and vehicles must remain within graded areas. The contractor will also identify and implement as appropriate specific procedures for handling and containment of hazardous materials, including catch basins and absorbent pads. • Wherever construction work is performed near a creek, reservoir, or drainage area (excluding work that is permitted for working in the drainage itself), a 100 foot vegetative or engineered buffer will be maintained between the construction zone and surface water body. Specific water bodies to be protected through implementation of this BMP include but are not limited to: Los Vaqueros Reservoir, Kellogg and Brushy Creeks, Bethany Reservoir, the South Bay Aqueduct, and/or other seasonal drainages. • Native and annual grasses or other vegetative cover will be established on construction sites immediately upon completion of work causing disturbance. **Measure 4.5.1b:** If groundwater cannot be contained onsite during construction, the construction contractor(s) will ensure that the water is pumped into multiple Baker tanks or approved equivalent with either a filter or gel coagulant system or other containment to remove sediment. The remaining water will then be discharged to a designated receiving water body or via land application in accordance with the requirements of RWQCB Order No. 5-00-175. On upland areas, sprinkler systems may be used to disperse the water in support of revegetation efforts. BMPs, as described in the SWPPP, will also be implemented to retain, treat, and dispose of groundwater. Measures will include but are not limited to:	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.5: Local Hydrology, Drainage and Water Quality (continued)				
(4.5.1 continued)			• Retaining pumped groundwater in surface facilities to reduce turbidity and suspended sediment concentrations; • Treating (i.e., flocculating) pumped groundwater to reduce turbidity and concentrations of suspended sediments if turbidity exceeds RWQCB effluent limitations as defined in General Order 5-00-175; • Directly conveying pumped groundwater to a suitable land disposal area capable of percolating flows; • If contamination is suspected, water collected during dewatering will be tested for contamination prior to disposal; • Discharges will comply with the RWQCB's requirements.	
4.5.2: Construction and operation of the project alternatives would not deplete local groundwater supplies or interfere with groundwater recharge.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.5.3: Project alternatives would not substantially alter drainage patterns but reservoir expansion would increase the reservoir shoreline area subject to erosion.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.5.4: Project alternatives would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff during operation.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.5.2:** CCWD shall design facilities with introduced impervious surfaces with stormwater control measures that are consistent with the Regional Water Quality Control Board's NPDES municipal stormwater runoff requirements. The stormwater control measures shall be designed and implemented to reduce the discharge of stormwater pollutants to the maximum extent practical. Stormwater controls such as bioretention facilities, flow-through planters, detention basins, vegetative swales, covering pollutant sources, oil/water separators, retention ponds, shall be designed to control stormwater quality to the maximum extent practical. In addition, CCWD shall prepare and implement a Stormwater Facility Operation and Management Plan that assigns responsibility for maintenance of stormwater facilities for the life of the project.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.5: Local Hydrology, Drainage and Water Quality (continued)				
4.5.5: Project Alternatives 1, 2, and 3 could place structures within a 100-year flood hazard area as mapped on a federal Flood Insurance Rate Map, which could impede or redirect flood flows.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.5.6: The project alternatives would not substantially increase the exposure of people and/or structures to risks associated with inundation by dam or levee failure.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.5.7: Construction and operation of the project alternatives would not make a cumulatively considerable contribution to cumulative effects on drainage, flooding, groundwater recharge or water quality degradation in the project area.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.6: Biological Resources				
4.6.1: Project construction would affect the following NCCP habitat types (CDFG sensitive plant communities in parentheses): Natural Seasonal Wetland (i.e., bulrush-cattail series, northern claypan vernal pool, bush seepweed and saltgrass series), Valley/Foothill Riparian (i.e., Fremont cottonwood series and valley oak series), Grassland (i.e., purple needlegrass series) and Valley/Foothill Woodland Forest (i.e., blue oak series).	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	The distribution and extent of sensitive plant communities has been mapped and documented for all project facilities, both within and outside the watershed. Mitigation Measures 4.6.1a and 4.6.1b include sensitive resource avoidance, impact minimization, restoration of temporarily disturbed sensitive plant communities, and compensation for permanent, unavoidable losses through restoration, enhancement, creation, and preservation; implementation of these measures would reduce the impacts on sensitive plant communities from construction of all facilities to a less-than-significant level. Compensation measures presented in this section have been integrated into a comprehensive biological resources mitigation and compensation program, which is presented in Section 4.6.3. **Measure 4.6.1a:** Based on the documented distribution of sensitive plant communities, CCWD shall implement avoidance and minimization measures to minimize impacts on sensitive plant communities during project construction. To the extent feasible, project design shall minimize impacts on sensitive plant communities. Exclusion and/or silt fencing shall be installed to buffer avoided areas. Natural Seasonal Wetland habitat (bush seepweed) shall be avoided within the Western substation study area by siting facilities to avoid to this plant community.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.1 continued)			**Measure 4.6.1b:** Where avoidance of sensitive plant communities is not possible, CCWD shall provide compensation through habitat creation, enhancement, and preservation, both within and outside the watershed, for temporary and permanent impacts on the following sensitive plant communities that will be affected by the project: *Natural Seasonal Wetland (Bulrush-cattail Series, Northern Claypan Vernal Pool, Bush Seepweed, and Saltgrass Series)* • CCWD shall implement Mitigation Measure 4.6.2, presented below, to minimize, and compensate for impacts to sensitive plant communities associated with jurisdictional wetlands and other waters of the United States. *Valley Oak, Blue Oak Woodlands, and Fremont Cottonwood Series* • CCWD shall develop an oak woodland mitigation and monitoring plan to outline mitigation and monitoring obligations for impacts resulting from increased reservoir levels and construction activities. This plan shall include restoration, enhancement, and/or preservation sites; thresholds of success; monitoring and reporting requirements; site-specific designs for site restoration/enhancement activities; and long-term maintenance activities as set forth in the following bullets. • Under the oak woodland mitigation and monitoring plan, CCWD shall acquire or dedicate land suitable for blue oak woodland and riparian woodland (valley oak and Fremont cottonwood series) restoration, enhancement, and preservation. If restoration is feasible, then a ratio of at least 2:1 shall be used. If preservation (with enhancement) is used, at least a 3:1 ratio shall be implemented to offset losses. • Due to the limited availability of suitable mitigation lands in the watershed, CCWD shall purchase blue oak mitigation lands outside of the watershed. • CCWD shall coordinate acquisition of woodland mitigation lands with USFWS to minimize potential conflicts with regional San Joaquin kit fox planning efforts, which seek to maintain open grasslands movement corridors. • CCWD shall submit the mitigation and monitoring plan to the appropriate regulatory agencies for approval.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.1 continued)			*Purple Needlegrass Grasslands* • CCWD shall seed disturbed areas within this habitat area with native grass seed collected within or in the vicinity of impacts. Additional seed could be used to supplement seed mixes, but seed shall be from locally collected (within the ecoregion) source material and shall be appropriately selected for site conditions. • Consistent with MSCS guidance (CALFED, 2000) and coordination with CDFG and USFWS, mitigation for loss of this plant community shall be provided by preservation and enhancement of mitigation lands at a minimum of a 2:1 mitigation ratio to compensate for permanent losses. • CCWD shall develop and implement a native grassland restoration and enhancement plan to identify potential seed collection sites, quantities of seed required, potential enhancement areas within the Los Vaqueros Watershed, potential enhancement activities, and other measures required to maintain the sustainability of native grassland restoration and enhancement areas.	
4.6.2: Project construction could affect potentially jurisdictional wetlands or waters, and streambeds and banks regulated by CDFG.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.6.2a:** Final project design shall avoid and minimize the fill of wetlands and other waters to the greatest practicable extent. Areas that are avoided shall be subject to best management practices under the General National Pollutant Discharge Elimination System Permit, as described in Measure 4.5.1. The fill of wetlands at the proposed Western substation site shall be avoided by siting facilities within the study area so as to avoid impacts to such areas. **Measure 4.6.2b:** Where jurisdictional wetlands and other waters cannot be avoided, to offset temporary and permanent impacts that would occur as a result of the project, restoration and compensatory mitigation shall be provided through the following mechanisms: 1. Purchase or dedication of land to provide wetland preservation, restoration or creation. If restoration is available and feasible, then a ratio of at least 2:1 shall be used. If a wetland needs to be created, at least a 3:1 ratio shall be implemented to offset losses. Where practical and feasible, onsite mitigation shall be implemented.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.2 continued)			2. A wetland mitigation and monitoring plan shall be developed by a qualified biologist in coordination with CDFG, USFWS, USACE, and/or RWQCB that details mitigation and monitoring obligations for temporary and permanent impacts to wetlands and other waters as a result of construction activities. The plan shall quantify the total acreage lost, describe mitigation ratios for lost habitat, annual success criteria, mitigation sites, monitoring and reporting requirements, and site specific plans to compensate for wetland losses resulting from the project. 3. The mitigation and monitoring plan shall be submitted to the appropriate regulatory agencies for approval.	
4.6.3: Project construction could affect populations of special-status plant species including brittlescale, San Joaquin spearscale, Brewer's dwarf-flax, and rose-mallow.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM NI	Mitigation Measures 4.6.3a and 4.6.3b include focused plant surveys coupled with avoidance and minimization of impacts; harvesting, transplanting, and long-term maintenance of affected individuals; and the establishment of permanent mitigation sites that provide the specific habitat needs for each affected species. Implementation of these mitigation measures would reduce the impacts on special-status plant species to a less-than-significant level. **Measure 4.6.3a:** Where necessary (see Figures 4.6-12 and 13), CCWD shall complete focused plant surveys on out-of-watershed pipeline alignments and facilities following CDFG and USFWS special-status plant survey guidelines. Comprehensive special-status plant surveys have been completed, except at a few sites on the Transfer-Bethany Pipeline alignment, within the Western substation siting zone (Power Option 1), and within the Western powerline alignment associated with Power Option 2 (i.e., within the siting zone for the new Western substation described above) and 2) and north of the Skinner Delta Fish Protective Facility (Power Option 2). Surveys shall document the location, extent, and size of Atriplex (brittlescale and heartscale) populations, if present, and shall be used to inform the planned avoidance of rare plant populations whenever possible. The Western substation shall be sited within the Western substation study area so as to avoid and minimize impacts to San Joaquin spearscale. To the extent feasible, the final project design shall minimize impacts on known special-status plant populations within and next to the construction footprints. CCWD and its contractors will design facilities to avoid sensitive plant populations whenever feasible, and shall install exclusion fencing and/or silt fencing around sensitive plant populations with as large a buffer as possible to minimize the potential for direct and indirect impacts such as fugitive dust and accidental intrusion into sensitive areas. Dust and erosion control measures are described in Measure 4.5.1.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.3 continued)			**Measure 4.6.3b:** Where avoidance is not feasible, CCWD shall compensate for the loss of special-status plants through the following steps: • A qualified ecologist shall develop and implement a restoration and mitigation plan according to CDFG guidelines and in coordination with CDFG and USFWS. At a minimum, the plan shall include collection of reproductive structures from affected plants, a full description of microhabitat conditions necessary for each affected species, seed germination requirements, restoration techniques for temporarily disturbed occurrences, assessments of potential transplant and enhancement sites, success and performance criteria, and monitoring programs, as well as measures to ensure long-term sustainability. The mitigation plan shall apply to portions of the Los Vaqueros Watershed, portions of Transfer-Bethany Pipeline that require vernal pool restoration (i.e., near Byron Airport), and areas that support rose-mallow on the banks of Old River. • Land that supports known populations of affected special-status plants shall be identified, enhanced, and protected within the watershed or acquired outside of the watershed at a ratio of 1.1:1 and protected in perpetuity with conservation easements.	
4.6.4: Project construction would result in impacts on California red-legged frog and California tiger salamander, including aquatic breeding habitat and upland aestivation habitat for these species.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	The implementation of Measure 4.6.4a, which includes measures to avoid and minimize take of individual frogs and salamanders, and Measure 4.6.4b, which provides for habitat compensation and enhancement, would reduce the impacts on California red-legged frogs and California tiger salamanders to a less-than-significant level. **Measure 4.6.4a:** CCWD shall implement measures to minimize and avoid take of California red-legged frogs and California tiger salamanders. Before and during construction, the following actions shall minimize impacts on these species: • CCWD shall submit the name and credentials of a biologist qualified to act as construction monitor to USFWS for approval at least 15 days before construction work begins. General minimum qualifications are a 4-year degree in biological sciences or other appropriate training and/or experience in surveying, identifying, and handling California tiger salamanders and California red-legged frogs. • A USFWS-approved biologist shall survey the work sites 2 weeks before the onset of construction. If California tiger salamanders or California red-legged frogs (or their tadpoles or eggs) are found, the approved	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.4 continued)			biologist shall contact USFWS to determine whether moving any of these life-stages is appropriate. If USFWS approves moving the animals, the approved biologist shall be allowed sufficient time to move frogs and/or salamanders from the work sites before work begins. If these species are not identified, construction can proceed at these sites. The approved biologist shall use professional judgment to determine whether (and if so, when) the California tiger salamanders and/or California red-legged frogs are to be moved. The USFWS-approved biologist shall immediately inform the construction manager that work should be halted, if necessary, to avert avoidable take of listed species. • Areas will be monitored during construction to identify, capture, and relocate sensitive amphibians, if present. • A detailed California red-legged frog/California tiger salamander relocation plan will be prepared at least 3 weeks before the start of groundbreaking, and submitted to USFWS for review. The purpose of the plan is to standardize amphibian relocation methods and relocation sites. • A USFWS-approved biologist shall be present at the active work sites until California red-legged frogs and California tiger salamanders have been removed, and habitat disturbance has been completed. Thereafter, the contractor or CCWD shall designate a person to monitor onsite compliance with all minimization measures. A USFWS-approved biologist shall ensure that this individual receives training consistent with USFWS requirements. • CCWD and its contractors shall initiate all work within potential California red-legged frog aquatic breeding habitat between May 1 and November 1 (i.e., generally identified as the nonbreeding season). Project construction timing constraints are summarized in Section 4.6.3. • CCWD and its contractors shall install frog-exclusion fencing (i.e., silt fences) around all construction areas that are within 100 feet of potential California red-legged frog or California tiger salamander aquatic breeding habitat. • A USFWS-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the California red-legged frog and California tiger	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative	Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)			
(4.6.4 continued)		salamander and their habitat, the importance of these species and their habitat, the general measures that are being implemented to conserve the red-legged frog and tiger salamander as they relate to the project, and the boundaries within which the project construction shall occur. • During work activities, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. After construction, the contractor shall remove all trash and construction debris from work areas on a daily basis. • All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 20 meters (65.6 feet) from any riparian habitat or water body. • Before the onset of work, CCWD shall prepare a stormwater pollution prevention plan and water pollution control plan as described in Measures 4.5.1a and 4.5.1b to allow prompt and effective response to any accidental spills. • Before construction begins, CCWD shall prepare a plan describing pre-project conditions, restoration, and monitoring success criteria. CCWD or its contractors shall restore the contours and revegetate all areas disturbed by the project with an appropriate assemblage of native vegetation suitable to the area. • Where needed to maintain California red-legged frog and/or California tiger salamander breeding in existing mitigation wetlands that are presently supplemented with water, but are not directly disrupted by construction, CCWD shall continue to provide supplemental water to these ponds during and after construction according to the existing terms and conditions for these mitigation sites. **Measure 4.6.4b:** CCWD shall provide compensation for permanent and temporary impacts on California tiger salamander and California red-legged frog aquatic habitat. In accordance with MSCS (CALFED, 2000) objectives, CCWD shall provide compensation for the permanent loss of California red-legged frog and California tiger salamander aquatic habitat at a minimum of a 3:1 ratio. The MSCS does not require compensation for loss of California red-legged frog and California tiger salamander aestivation habitat. To satisfy compensation guidelines, CCWD shall implement the following measures:	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.4 continued)			• CCWD shall mitigate for the loss of aquatic breeding sites that will be filled or otherwise directly affected by the project (estimated to be 16 sites at this time; number to be confirmed by pre-construction surveys) as well as mitigate for impacts on associated California red-legged frog upland habitat by providing compensatory habitat. • CCWD shall develop and implement a mitigation, monitoring, and management plan, with input from regulatory agencies that shall outline long-term management strategies and performance standards to be attained to compensate for habitat losses resulting from the project. At a minimum, the plan shall include standards for mitigation site selection and construction specifications for mitigation sites, a description of site conditions including aerial maps, an analysis of local amphibian habitat (e.g., is another breeding habitat nearby?), and performance criteria by which site quality can be assessed over time (see below). A monitoring program shall be established to track the development of habitat conditions that are conducive to the establishment of the California red-legged frog and/or California tiger salamander breeding populations. Long-term monitoring (e.g., night surveys and aquatic dipnet surveys) shall be performed on an annual basis to determine if these species are present. The plan shall provide that monitoring be performed to ensure that mitigation ponds that are dependent upon artificial water function as designed. • Performance criteria shall be used to assess the success of aquatic habitat created for California red-legged frogs and California tiger salamander aquatic habitat. These criteria shall be outlined in the mitigation, monitoring and management plan and shall include: - A description of the type of habitat to be created (e.g., permanent marsh consisting of open water and emergent vegetation; semipermanent marsh); - The total area, size and number of California red-legged frog and California tiger salamander mitigation ponds to be created based on a comparable loss of breeding sites (e.g., 1:1 replacement ratio) as a result of the project. These ponds shall concurrently satisfy wetland mitigation requirements identified in Measure 4.6.2b;	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.4 continued)			- Constructed permanent marsh ponds that are designed to support California red-legged frog breeding shall provide: ▪ at least 75% absolute vegetation cover of wetland plant species within shallow water emergent vegetation zones; ▪ year-round inundation with depths of at least 1.5 feet in the vegetation zone and 4 feet in open water. - Constructed semipermanent marsh ponds that are designed to support California tiger salamander or California red-legged frog breeding habitat shall provide: ▪ water regimes similar to affected features, with semi-permanent water ranging from depths of 1.5 to 2.5 feet or greater during a typical rainfall year and an inundation period that exceeds 120 consecutive days; a predominance of seasonal wetland plants (at least 75% absolute vegetation cover) during the winter/spring monitoring period (though may support upland species later in the year when pools dry). • To the greatest practicable extent, CCWD or its contractors shall construct and manage compensation habitat (i.e., replacement ponds) for California red-legged frogs and California tiger salamanders prior to project implementation. A qualified biologist shall ensure that ponds are functioning before the removal and/or inundation of existing California tiger salamander and California red-legged frog aquatic breeding sites. • Construction within the Kellogg Creek corridor (i.e., creek crossing sites) shall be designed to impact the smallest area required to provide for the installation of pipelines, particularly in the area below Los Vaqueros Dam. • CCWD and its contractors shall restore and enhance Kellogg Creek and adjacent natural upland environs in the project area (about 4.0 linear miles) to restore suitable aquatic breeding habitat for California red-legged frogs and restore disturbed upland areas as close as possible to pre-project conditions. Methods of enhancement and restoration could include, but are not limited to, reducing erosion; installing breeding ponds; excluding cattle from sensitive areas; and managing, salvaging, and seeding with grasses, forbs, and other species that are native to the site, as well as other measures to increase water quality within the enhancement and restoration reach.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.4 continued)			New mitigation ponds that are created for California red-legged frog and California tiger salamander shall be hydrologically self-sustaining and shall not require a supplemental water supply. Because few natural drainages in the Los Vaqueros Watershed could maintain self-sustaining mitigation ponds, a portion of the pond mitigation locations will likely be identified outside of the watershed.	
4.6.5: Project construction would result in direct and indirect impacts on existing populations of and habitat for the western pond turtle.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	The implementation of Mitigation Measure 4.6.5, which includes biological monitoring and turtle relocation, would reduce project impacts on western pond turtle populations and habitat to a less-than-significant level: **Measure 4.6.5:** Before construction activities begin, a qualified biologist shall conduct western pond turtle surveys within creeks and in other ponded areas affected by the project. Upland areas shall also be examined for evidence of nests as well as individual turtles. The project biologist shall be responsible for the survey and for the relocation of turtles. Construction shall not proceed until a reasonable effort has been made to capture and relocate as many western pond turtles as possible to minimize take. However, some individuals may be undetected or enter sites after surveys, and would be subject to mortality. If a nest is observed, a biologist with the appropriate permits and prior approval from CDFG shall move eggs to a suitable location or facility for incubation, and release hatchlings into the creek system the following autumn. In addition, western pond turtles shall be included in the fish rescue operation described in Mitigation Measure 4.3.3 (Alternatives 1 and 2 only).	No Impact Less Than Significant
4.6.6: Project construction under Alternatives 1, 2, and 3 would result in direct and indirect impacts on listed vernal pool fairy shrimp and their habitat, and on the non-listed midvalley fairy shrimp and curved-foot hygrotus diving beetle.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM NI	The measures proposed below would mitigate impacts to both vernal pool fairy shrimp and midvalley fairy shrimp to a less-than-significant level. The implementation of Measure 4.6.4b, which provides compensation for temporary and permanent impacts to sensitive amphibian habitat in seasonal ponds, would reduce impacts to curved-foot hygrotus diving beetles to a less-than-significant level. **Measure 4.6.6a:** CCWD shall assume the presence of listed vernal pool branchiopods in all suitable habitat for which CCWD chooses not to perform protocol-level surveys. Preliminary branchiopod surveys (ESA, 2008a) have documented the general distribution of and habitat for vernal pool fairy shrimp in the project area. Longhorn fairy shrimp are	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.6 continued)			not expected in the project areas based on this species' narrow habitat requirements, restricted range, and available habitat. CCWD shall minimize impacts on listed vernal pool branchiopods. To avoid and minimize direct and indirect impacts on listed vernal pool branchiopods, standard water quality protection measures shall be implemented as established in Mitigation Measure 4.5.1. Additional measures to minimize and avoid habitat for listed vernal pool branchiopods shall be implemented as required by USFWS and include: • Avoidance of potential habitat by narrowing work corridors near potential vernal pool branchiopod habitat to the greatest extent practicable. • Establishment of 250-foot buffers around potential branchiopod habitat, which is a typical avoidance distance that is recommended by the USFWS to minimize and avoid direct and indirect impacts. For the Kellogg Creek vernal pool complex the following protection measures shall be implemented: • Land uses in the easternmost portion of the Los Vaqueros Watershed shall remain restricted to activities associated with wind energy generation, dry-land farming, grazing, and administration by CCWD. • East of Los Vaqueros Reservoir, public access shall be restricted from CDFG conservation easement lands at the Kellogg Creek vernal pool complex and lands within 500 feet. Public access shall be restricted to research and occasional educational activities conducted under the supervision of CCWD staff or other designated land management agencies. • The eastside trail and other public access trails located in proximity to the vernal pool complex shall be 500 feet or farther from the CDFG conservation easement and beyond direct line of sight to rock outcrop features. • The eastern boundary of the public access area shall be fenced to prevent human access to the vernal pool complex and this fence and the Kellogg Creek vernal pools area shall be patrolled to ensure that no trespassing happens and that the fence remains intact.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.6 continued)			• Before opening the eastside trail to public access, a biological evaluation shall be prepared by CCWD that establishes baseline environmental conditions at the vernal pool complex. Elements to be assessed include signs of trespass (e.g., trash, fires, site trampling, wear marks, rocks or other features in pools, or bicycle tire tracks), an evaluation of water quality during winter months to include at a minimum total dissolved solids, pH, and alkalinity, and documentation of any site damage. These conditions will be used as a basis for later site evaluations. An assessment of branchiopod populations shall also be provided as a component of the baseline evaluation. • If excessive trespass, defined here as noticeable site deterioration relative to baseline conditions, is identified at the vernal pool complex CCWD shall immediately coordinate with USFWS. If site damage is identified, corrective remedies shall be implemented to prevent further harm to the complex. Such actions may include removing trash or debris from the complex, closing portions of the eastside trail to public access, enhancing site fencing, or other remedies to prevent trespass. • While the eastside trail remains open to public access, annual reports shall be prepared to document site conditions relative to baseline conditions. • Permanent signage shall be installed within 50 feet of the Kellogg Creek vernal pool complex (or on the surrounding fence) that specifies that, “This area is habitat of the vernal pool fairy shrimp, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.” • A USFWS-approved construction monitor shall be present during construction within 0.5 mile of the Kellogg Creek vernal pool complex, as identified in the 1995 BO (USFWS, 1995). **Measure 4.6.6b:** CCWD shall mitigate for impacts to vernal pool fairy shrimp habitat through one or more of the following steps to provide compensatory habitat: (a) salvage of cysts and creation of replacement pool habitat in the local area at a replacement ratio of at least 3:1, (b) restoration of affected pools onsite after construction completion, or (c) acquisition of credits from a local mitigation bank(s).	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.6 continued)			To mitigate for the loss of aquatic sites on the Delta-Transfer Pipeline and Transfer-Bethany Pipeline alignments where vernal pool branchiopods are presumed present, CCWD shall implement the following measures: • CCWD shall mitigate for the loss of branchiopod habitat that will be filled or otherwise directly affected by the project (estimated to be 17 pools) by providing compensatory habitat. • For portions of the Transfer-Bethany Pipeline alignment near Byron Airport (e.g., adjacent to Wildlands' Byron Conservation Bank and Contra Costa County lands at Byron Airport) that support vernal pools, CCWD shall conduct a preconstruction land survey of the pipeline construction area to document current conditions of topography and existing drainage patterns, and to document shallow soil lithology within the construction area footprint as a baseline for restoring vernal pool hydrology following construction. In areas where claypan soils are encountered within critical habitat for vernal pool fairy shrimp (and Contra Costa goldfields) the upper clay soil layer shall be locally stockpiled and reestablished in place following pipeline installation. Upon completion of construction activities, final grading shall be completed to maintain surface flow conditions, local hydrology and similar compaction of surface soils to that of the documented current conditions prior to construction activities. • CCWD shall develop and implement a mitigation, monitoring, and management plan, with input from regulatory agencies that shall outline long-term management strategies and performance standards to be attained to compensate for habitat losses resulting from the project. At a minimum, the plan shall include standards for mitigation site selection and construction specifications for mitigation sites, a description of site conditions including aerial maps, an analysis of local branchiopod habitat, and performance criteria by which site quality can be assessed over time (e.g., size, vegetation species present, date of initial ponding, ponding duration, and wildlife usage). A monitoring program will be established to track the development of habitat conditions that are conducive to the establishment of vernal pool branchiopods. • To the greatest practicable extent, CCWD or its contractors shall construct compensation habitat (i.e., replacement pools) before habitat disturbances are incurred; or directly within the project footprint after construction. A qualified biologist shall ensure that ponds are functioning as designed.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.6 continued)			• CCWD shall submit the name and credentials of a biologist qualified to act as construction monitor to USFWS for approval at least 15 days before construction work begins. • With concurrence from the USFWS, a USFWS-approved biologist shall salvage soils from sites that are known to support vernal pool branchiopods at least 2 weeks before the onset of construction, or during the preceding dry season if pools are anticipated to hold water when construction begins. The salvaged soil samples will be stored and used to inoculate created pools once minimum performance standards are met at these locations. • A USFWS-approved biologist shall be present at each active work site within 0.5 mile of potential fairy shrimp habitat until habitat disturbance has been completed. Thereafter, the contractor or CCWD shall designate a person to monitor onsite compliance with all minimization measures. A USFWS-approved biologist shall ensure that this individual receives training consistent with USFWS requirements. • A USFWS-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the vernal pool fairy shrimp and their habitat, the importance of these species and their habitat, the general measures that are being implemented to conserve fairy shrimp as they relate to the project, and the boundaries within which the project construction shall occur. • All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 100 feet from any fairy shrimp habitat.	
4.6.7: Project construction would have temporary and permanent impacts on potential San Joaquin kit fox habitat and permanently reduce potential regional movement opportunities in one location for this species.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM/SU LSM/SU LSM/SU LSM/SU	**Measure 4.6.7a:** CCWD shall implement San Joaquin kit fox protection measures. The following measures, which are intended to reduce direct and indirect project impacts on San Joaquin kit foxes, are derived from the San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS, 1999a) and the Standardized Recommendations for Protection of the San Joaquin Kit Fox (USFWS, 1999b). These measures shall be implemented for construction areas along pipeline corridors, staging areas, and facilities within the watershed: • Preconstruction surveys shall be conducted within 200 feet of work areas to identify potential San Joaquin kit fox dens or other refugia in and surrounding workstations. A qualified biologist shall conduct the	No Impact Less than significant for habitat impacts except loss of the potential movement corridor on the western side of the reservoir, which would remain a significant and unavoidable effect of the project under all project alternatives. Although the proposed mitigation program includes acquisition of habitat acres to compensate for the grassland acres

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.7 continued)			survey for potential kit fox dens 14 to 30 days before construction begins. All identified potential dens shall be monitored for evidence of kit fox use by placing an inert tracking medium at den entrances and monitoring for at least 3 consecutive nights. If no activity is detected at these den sites, they shall be closed following guidance established in USFWS Standardized Recommendations document. • If kit fox occupancy is determined at a given site, the construction manager should be immediately informed that work should be halted within 200 feet of the den and the USFWS contacted. Depending on the den type, reasonable and prudent measures to avoid effects to kit foxes could include seasonal limitations on project construction at the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence. • To minimize the possibility of inadvertent kit fox mortality, project-related vehicles shall observe a maximum 20 miles per hour speed limit on private roads in kit fox habitat. Nighttime vehicle traffic shall be kept to a minimum on nonmaintained roads. Off-road traffic outside the designated project area shall be prohibited in areas of kit fox habitat. • To prevent accidental entrapment of kit fox or other animals during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, fenced, or escape routes constructed of earthen materials or wooden planks shall be provided. Before filling, such holes shall be thoroughly inspected for trapped animals. • All food-related trash items (such as wrappers, cans, bottles, and food scraps) shall be disposed of in closed containers and removed daily from the project area. • To prevent harassment and mortality of kit foxes or destruction of their dens, no pets shall be allowed in the project area. **Measure 4.6.7b:** To compensate for impacts on San Joaquin kit fox habitat outside of dedicated CDFG conservation easements, CCWD shall provide mitigation either through acquiring and dedicating lands into conservation easements or purchasing mitigation credits at compensation ratios that have been approved by state and federal resource agencies.	affected by reservoir expansion, and the program also proposes acquisition of compensatory habitat in areas that preserve remaining movement corridors for the kit fox, these measures would not reduce or avoid the loss of the grassland along the western side of the reservoir. The loss of most of this grassland strip to inundation and therefore of this specific potential movement corridor is unavoidable.

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.7 continued)			Consistent with MSCS and USFWS guidance, mitigation ratios applied for impacts on San Joaquin kit fox habitat shall be 1:1 to 1.1:1 for temporary impacts; 1:1 to 2:1 for long-term temporary impacts; and 1:1 to 3:1 for permanent impacts. CCWD shall acquire San Joaquin kit fox mitigation lands based on anticipated impacts to suitable habitat and mitigation ratios identified by the MSCS and USFWS (see Table 4.6-14). San Joaquin kit fox mitigation obligations may concurrently satisfy burrowing owl mitigation obligations identified in Mitigation Measure 4.6.8, below, if suitable habitat is present for both species in mitigation lands. The availability of mitigation lands to satisfy mitigation requirements for these species is discussed in the Comprehensive Biological Resources Mitigation and Compensation Program (Section 4.6.3). **Measure 4.6.7c:** CCWD shall replace any acreage of existing kit fox easement affected by the project with an equivalent amount of acreage within the watershed to maintain under conservation easement the full amount required for the original Los Vaqueros Reservoir Expansion Project. In addition, CCWD shall provide compensation for conservation easement acreage affected at a ratio of up to 3:1, including conservation easement lands that are isolated by the project (see Table 4.6-14). Compensation for temporary impacts to lands within conservation easements shall be provided at a ratio of 1:1 to 1.1:1.	
4.6.8: Project construction would result in temporary and permanent loss of habitat for burrowing owls.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	The implementation of Mitigation Measure 4.6.8a, which requires preconstruction surveys and protection measures to avoid burrowing owls during the breeding season, and Measure 4.6.8b, which includes the establishment of mitigation lands for loss of habitat as required by regulatory permits, would reduce potential impacts on burrowing owls to a less-than-significant level. **Measure 4.6.8a:** CCWD shall implement the measures listed below for grassland habitats to reduce potential impacts to a less-than-significant-level and to avoid incidental take of burrowing owls. In advance of construction, CCWD shall follow the current CDFG burrowing owl survey guidance, presently the Burrowing Owl Consortium multi-phase approach to evaluate burrowing owl use. Measures shall apply to all construction activities near active nests or within potential burrowing owl nesting habitat, to avoid, minimize, or mitigate impacts on burrowing owls: *Breeding season surveys* shall be performed to determine the presence of burrowing owls for the purposes of inventory, monitoring, avoidance of take,	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.8 continued)			and determining appropriate mitigation. In California the breeding season begins as early as February 1 and continues through August 31. Under the Burrowing Owl Consortium's multi-phase survey methodology, for areas within 500 feet of construction boundaries, CCWD shall: 1) perform a habitat assessment to identify essential components of burrowing owl habitat, including artificial nest features; 2) perform intensive burrow surveys in areas that are identified to provide suitable burrowing owl habitat, and; 3) perform at least four appropriately-timed breeding season surveys (four survey visits spread evenly [roughly every 3 weeks] during the peak of the breeding season, from April 15 to July 15) to document habitat use. *Pre-construction surveys* shall be used to assess the owl presence before site modification is scheduled to begin. Initial pre-construction surveys should be conducted outside of the owl breeding season (February 1–August 31), but as close as possible to the date that ground-disturbing activities will begin. Generally, initial pre-construction surveys should be conducted within 7 days, but no more than 30 days prior to ground-disturbing activities. Additional surveys may be required when the initial disturbance is followed by periods of inactivity or the development is phased spatially and/or temporally over the project area. Up to four or more survey visits performed on separate days may be required to assure with a high degree of certainty that site modification and grading will not take owls. The full extent of the pre-construction survey effort shall be described and mapped in detail (e.g., dates, time periods, area[s] covered, and methods employed) in a biological report that will provided for review to CDFG. In addition to the above survey requirements, the following measures shall be implemented to reduce project impacts to burrowing owls: • Construction exclusion areas (e.g., orange exclusion fence or signage) shall be established around occupied burrows, where no disturbance shall be allowed. During the nonbreeding season (September 1 through January 31), the exclusion zone shall extend at least 160 feet around occupied burrows. During the breeding season (February 1 through August 31), exclusion areas shall extend 250 feet around occupied burrows (or farther if warranted to avoid nest abandonment). • If work or exclusion areas conflict with owl burrows, passive relocation of onsite owls could be implemented as an alternative, but only during the nonbreeding season and only with CDFG approval. The approach to owl relocation and burrow closure will vary depending on the number of	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.8 continued)			occupied burrows. Passive relocation shall be accomplished by installing one-way doors on the entrances of burrows within 160 feet of the project area. The one-way doors shall be left in place for 48 hours to ensure the owls have left the burrow. The burrows shall then be excavated with a qualified biologist present. Construction shall not proceed until the project area is deemed free of owls. • Unoccupied burrows within the immediate construction area shall be excavated using hand tools, and then filled to prevent reoccupation. If any burrowing owls are discovered during the excavation, the excavation shall cease and the owl shall be allowed to escape. Excavation could be completed when the biological monitor confirms the burrow is empty. • Artificial nesting burrows will be provided as a temporary measure when natural burrows are lacking. To compensate for lost nest burrows, artificial burrows shall be provided outside the 160-foot buffer zone (CDFG, 1995). The alternate burrows shall be monitored daily for 7 days to confirm that the owls have moved in and acclimated to the new burrow. **Measure 4.6.8b:** CCWD shall compensate for permanent habitat losses at a minimum 2:1 ratio (possibly concurrent with other mitigation commitments, such as those for San Joaquin kit fox, provided habitat is present for both species). Compensation could consist of purchasing and enhancing suitable habitat, converting it to a conservation easement, and conveying the easement to a managing agency or institution in perpetuity; participating in a resource agency-approved mitigation bank that provides offset mitigation credits for loss of burrowing owl habitat; or a combination of both. Burrowing owl mitigation areas shall support burrowing owl populations in similar or greater densities to those on impacted burrowing owl habitat.	
4.6.9: Project construction and operation activities would result in direct and indirect impacts on existing populations of and habitat for the golden eagle, bald eagle, and Swainson's hawk.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM/B (bald eagle) LSM/B (bald eagle) LSM/B (bald eagle) LSM/B (bald eagle)	Implementation of Mitigation Measures 4.6.9a (for all three species) and 4.6.9b (for golden eagle and Swainson's hawks) would reduce potential impacts associated with project construction to a less-than-significant level. **Measure 4.6.9a:** CCWD shall ensure that nesting golden eagles, bald eagles, and Swainson's hawks are protected. The following measures address potential impacts on nesting golden eagles and Swainson's hawks in the project vicinity. Measures that pertain to golden eagles and their nests would apply to nesting bald eagles, were they found in the Los Vaqueros Watershed prior to construction.	No Impact Less Than Significant Beneficial –Bald Eagle

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.9 continued)			• Whenever feasible, construction near recently active nest sites shall start outside the active nesting season. The nesting period for golden eagles is between March 1 and August 15. Bald eagles and Swainson's hawks nest between March 15 and August 15. • If groundbreaking activities begin during the nesting period, a qualified biologist shall perform a preconstruction survey 14 to 30 days before the start of each new construction phase to search for golden eagle and Swainson's hawk nest sites within 0.5 mile of proposed activities. If active nests are not identified, no further action is required and construction may proceed. If active nests are identified, the avoidance guidelines identified below shall be implemented. • For golden eagles, construction contractors shall observe CDFG avoidance guidelines, which stipulate a minimum 500-foot buffer zone around active golden eagle nests. Buffer zones shall remain until young have fledged. For activities conducted with agency approval within this buffer zone, a qualified biologist shall monitor construction activities and the eagle nest(s) to monitor eagle reactions to activities. If activities are deemed to have a negative effect on nesting eagles, the biologist shall immediately inform the construction manager that work should be halted, and CDFG will be consulted. The resource agencies do not issue take authorization for this species. • If construction begins during the Swainson's hawk nesting period, a qualified biologist shall conduct preconstruction surveys at least 2 weeks prior to construction following CDFG guidance (e.g., CDFG, 2000) in areas that potentially provide nesting opportunities to verify species presence or absence. If the survey indicates presence of nesting Swainson's hawks within a 0.5-mile radius, the results shall be coordinated with CDFG to develop and implement suitable avoidance measures that include construction buffers and nest monitoring. • Consistent with the Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California (CDFG, 1994), mitigation shall include the following approach: - No intensive new disturbances or other project-related activities that could cause nest abandonment or forced fledging shall be initiated within 0.25 mile (buffer zone) of an active nest between March 15 and September 15.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.9 continued)			- Nest trees shall not be removed unless no feasible avoidance exists. If a nest tree must be removed, CCWD shall obtain a management authorization (including conditions to offset the loss of the nest tree) from CDFG. The tree removal period specified in the management authorization is generally between October 1 and February 1. - Monitoring of the nest by a qualified biologist may be required if the project-related activity has the potential to adversely impact the nest. • CDFG often allows construction activities that are initiated outside the nesting season to continue without cessation even if raptors such as golden eagles choose to nest within 500 feet of work activities. Thus, work at the dam construction site may continue without delay if surveys verify the local absence of nesting golden eagles, or if groundbreaking begins outside the nesting period (August 16 through February 28). • After construction, CCWD shall survey for and monitor golden eagle and bald eagle nesting sites in the Los Vaqueros Watershed to ensure that recreational activity and other beneficial uses of the watershed do not disrupt eagle nest sites. Surveys will be performed at the beginning of the nesting season and continue through the nesting season. Consistent with present policy, recreational access and other disruptive activities will be suspended within 500 feet of active eagle nests until the young eagles have fledged. **Measure 4.6.9b:** CCWD shall acquire and/or restore foraging habitat for Swainson's hawks and golden eagles in accordance with CALFED and CDFG guidelines, set forth in Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California (CDFG, 1994), as follows: • Compensate for permanent foraging habitat losses (e.g., agricultural lands and annual grasslands) within 1 mile of active Swainson's hawk nests (acreage to be determined during preconstruction surveys) at a ratio of 1 acre of mitigation lands for each acre of permanent development (i.e., 1:1 replacement ratio). Foraging habitat impacts will be largely limited to valve structures (roughly 10-foot square) every few hundred feet along pipeline routes, with less than an acre of anticipated foraging habitat loss. • Consistent with MSCS guidance, impacts to golden eagle foraging habitat will be provided by enhancing or restoring foraging habitat at ratio from ratio of 1:1 to 5:1.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
4.6.10: Project construction and increased reservoir water levels would result in temporary and permanent loss of potential and occupied habitat for Alameda whipsnakes.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.6.10a:** CCWD shall minimize and/or avoid construction-related impacts on Alameda whipsnakes through the development and implementation of an Alameda whipsnake protection and monitoring plan. USFWS shall approve this plan during formal consultation under FESA Section 7, and shall establish a program of preconstruction surveys and construction supervision to identify and prevent potential hazards to individual Alameda whipsnakes that could be present during construction. The plan shall prohibit or restrict activities that could harm or harass this species. Habitat restoration and compensation shall also be included in the plan. Measures in this plan shall include, but are not limited to, the following: • A description of the species habitat requirements and movement patterns applicable to the project area. • A procedure for conducting preconstruction surveys and/or trapping surveys before the onset of initial ground-disturbing activities in areas with high quality habitat, as well as monitoring to be conducted before construction and/or restoration begin each day that these activities shall occur. • Direct monitoring by a qualified biologist of the clearing of occupied or potentially occupied coastal scrub in the project area that would be directly affected by project construction (not by inundation). Construction shall not proceed until areas have been surveyed to capture and relocate as many Alameda whipsnakes as reasonably possible to minimize take. However, some individuals may be undetected or move in following surveys and would be subject to take. • A protocol for the selection of USFWS-approved biological monitors who have experience with Alameda whipsnakes to monitor construction activities (such as initial clearing and grading, excavation, and the installation of silt fencing) within and next to Alameda whipsnake habitat. • Worker education materials and procedures for informing construction crews about the potential presence of Alameda whipsnakes, equipment operation procedures to minimize impacts to whipsnakes, responsibilities of project personnel (such as reporting observations of Alameda whipsnakes within or next to the construction area to the biological monitor), observing speed limits, avoiding use of the haul	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.10 continued)			road until cleared by the biological monitor, and other measures to avoid mortality of whipsnakes during construction; and the role of the monitoring staff in advising construction crews of compliance with take-avoidance measures for Alameda whipsnakes, documenting compliance in monitoring reports, and notifying USFWS within 24 hours of observation of whipsnakes within or next to a construction area. • Limit stockpiling and staging activities and vehicle and equipment refueling and maintenance to occur in nonsensitive areas. • CCWD shall prepare and implement a revegetation plan that describes pre-project conditions and available habitats for Alameda whipsnakes, invasive species control measures, and restoration and monitoring success criteria for undeveloped areas disturbed during project construction. The plan will provide the basis for the reestablishment of scrub habitat in disturbed areas and mitigation sites, and will include at a minimum an identification of mitigation areas, site preparation requirements, specifications for planting and/or seeding (e.g., what species and how many plantings), seasonal considerations for planting and site maintenance, the proposed irrigation strategy, performance criteria (e.g., 70 percent survival of plantings 5 years following installation, and 70 percent of plants exhibiting fair or better condition), any contingency measures that may be anticipated, and a provision for semi-annual monitoring and reporting. **Measure 4.6.10b:** Consistent with MSCS guidelines, CCWD shall provide compensation for permanent and temporary loss of upland scrub habitat that may support Alameda whipsnakes by either (1) compensating for permanent habitat losses by acquiring, protecting, and managing 2 to 5 acres of existing occupied habitat for every acre within the same area of occupied habitat that would be affected, and/or (2) enhancing or restoring 2 to 5 acres of suitable habitat near the affected areas for every acre of occupied habitat affected (CALFED, 2000).	
4.6.11: Project construction activities could result in direct and indirect impacts on the valley elderberry longhorn beetle and its habitat.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	The following measure is based on the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS, 1999c). **Measure 4.6.11:** CCWD shall implement USFWS guidelines (1999 or more current) for avoiding, minimizing, and mitigating project impacts on valley elderberry longhorn beetles. If avoidance is not feasible, USFWS general compensation guidelines call for replacement of elderberry plants in designated mitigation areas at a ratio from 2:1 to 5:1 for each stem greater	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.11 continued)			than 1 inch in diameter. Note that replacement ratios are by stem and not by elderberry shrub. Replacement stock shall be obtained from local sources. Plants are generally replaced at a 2:1 ratio for stems greater than 1 inch in diameter at ground level with no adult emergence holes, 3:1 for stems where emergence holes are evident in less than 50 percent of the shrubs, and 5:1 for stems greater than 1 inch in diameter with emergence holes.	
4.6.12: Project construction activities could affect active breeding bird nest sites and new powerlines could affect migratory birds.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.6.12a:** CCWD shall ensure that active nests of raptors and other special-status nesting birds are not disturbed during construction. If active construction work (i.e., ground clearing and grading, including removal of trees or shrubs) is scheduled to take place during the nonbreeding season (September 1 through January 31), no mitigation is required. If such construction activities are scheduled during the breeding season (February 1 through August 31), the following measures shall be implemented to avoid impacts on nesting raptors and other protected birds: • Within 30 days of construction, a qualified wildlife biologist shall conduct preconstruction surveys of all potential nesting habitat within 500 feet of construction sites where access is available. • If active nests are found during preconstruction surveys, a no-disturbance buffer (acceptable in size to CDFG) shall be created around active raptor nests and nests of other special-status birds during the breeding season, or until it is determined that all young have fledged. Typical buffers include 500 feet for raptors and 250 feet for other nesting birds (e.g., shorebirds, waterfowl, and passerine birds). The size of these buffer zones and types of construction activities restricted in these areas could be further modified during construction in coordination with CDFG and shall be based on existing noise and human disturbance levels in the project area. • If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation shall be required. Trees and shrubs within the construction footprint determined to be unoccupied by special-status birds, or that are outside the no-disturbance buffer for active nests, could be removed. • If construction commences during the nonbreeding season and continues into the breeding season, most songbirds that choose to nest next to active construction sites are generally considered to acclimate to	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.12 continued)			construction activities, though nest abandonment may occur in some instances. However, nesting site monitoring shall be conducted by CCWD and no-disturbance buffer zones established in coordination with CDFG around active nests to prevent impacts on nesting birds and their young. **Measure 4.6.12b:** CCWD shall follow Avian Protection Plan guidelines for powerlines. CCWD shall use state-of-the-art guidelines to reduce raptor mortality from interactions with powerlines. The Avian Power Line Interaction Committee (1994) and USFWS recommend the following: • Provide 60-inch minimum horizontal separation between energized conductors or energized conductors and grounded hardware, • Insulate hardware or conductors against simultaneous contact if adequate spacing is not possible, • Use Western-approved poles that minimize impacts to birds, and, • Increase the visibility of conductors or shield wires to prevent and minimize bird collisions. **Measure 4.6.12c:** Measures to reduce noise and vibration impact on nesting raptors near the dam and 275-TAF borrow area. As identified in Measure 4.6.12a, a qualified biologist will conduct preconstruction surveys and establish suitable avoidance buffers around active bird nests. Construction at the 275-TAF borrow area will begin either outside the active nesting season or after verification that breeding birds are absent within 500 feet of work areas. If it appears that noise or vibration from ongoing blasting or jack-hammering at the dam or 275-TAF borrow area could affect nesting raptors that arrive after the start of construction, specific measures shall be implemented to reduce noise levels. During blasting or jack-hammering, a noise level of no greater than 85 decibels (measured at the nest) will be used as general guidance for raptor nests that are established after construction. This parameter may be met through a variety of standard noise-reducing procedures for construction equipment, including the use of noise dissipaters and blasting mats. Contract specifications will include requirements for the use of blasting methods, including qualifications for the blasting contractor, the use of noise control methods and threshold noise levels, and other limitations. The	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.12 continued)			specifications will also require the submittal of a blasting plan by the contractor that will cover the proposed noise control techniques, blasting charge size and limits, and hours of blasting.	
4.6.13: Project construction activities under Alternatives 1 and 2 could affect designated critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields).	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM NI NI	See Measures 4.6.2a, 4.6.2b, 4.6.6a and 4.6.6b.	No Impact Less Than Significant
4.6.14: Project construction activities could affect nonlisted special-status reptile species (San Joaquin coachwhip and coast horned lizard).	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.6.14:** CCWD shall ensure that habitat disturbances are minimized in areas that are known or suspected to support San Joaquin coachwhip and coast horned lizard. Within 30 days before surface-disturbing activities, concurrent with other preconstruction wildlife surveys, a qualified biologist shall survey for special-status reptile populations. If individuals of these species are found in the project area, they shall be relocated to suitable habitat 0.5 mile or farther from the project area. Some individuals may be undetected or enter sites after surveys and would be subject to harm.	No Impact Less Than Significant
4.6.15: Project construction activities could affect nonlisted special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse).	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.6.15a:** CCWD shall minimize impacts on badgers through a combination of worker training, preconstruction surveys, and passively or actively relocating animals. Impacts on the San Joaquin pocket mouse and American badger would be reduced by limiting the footprint of direct project effects within the Western alignment. • A qualified biologist shall conduct a training session for all construction personnel focused on the protection and conservation of protected, nonlisted special-status wildlife species, including American badgers. At a minimum, the training shall include a species and habitat description for the American badger (in addition to other nonlisted special-status species). The training session shall identify the general measures that are being implemented to minimize impacts on these species as they relate to the project, and the boundaries within which the project could be accomplished. • Concurrent with other required surveys (e.g., as required for Mitigation Measure 4.7), during winter/spring months before new project activities, and concurrent with other preconstruction surveys (e.g., kit fox and burrowing owl), a qualified biologist shall perform a pre-activity survey to identify the presence of American badgers. If this species is not found, no further mitigation shall be required. If badgers are identified, they shall	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.15 continued)			be passively relocated using burrow exclusion (e.g., installing one-way doors on burrows) or similar CDFG-approved exclusion methods. In unique situations it might be necessary to actively relocate badgers (e.g., using live traps) to protect individuals from potentially harmful situations. Such relocation could be performed with advance CDFG coordination and concurrence. When unoccupied dens are encountered outside of work areas but within 100 feet of proposed activities, vacated dens shall be inspected to ensure they are empty and temporarily covered using plywood sheets or similar materials. • If badger occupancy is determined at a given site within the work area, the construction manager should be informed that work should be halted. Depending on the den type, reasonable and prudent measures to avoid harming badgers will be implemented and may include seasonal limitations on project construction near the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence. • To minimize the possibility of inadvertent badger mortality, project-related vehicles shall observe a maximum 20 miles per hour speed limit on private roads. • To prevent accidental entrapment of badgers or other animals during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, or escape routes constructed of earthen materials or wooden planks shall be provided. Before filling, such holes shall be thoroughly inspected for trapped animals. • All food-related trash items (such as wrappers, cans, bottles, and food scraps) shall be disposed of in closed containers and removed daily from the project area. • To prevent harassment and mortality of badgers or destruction of their dens, no pets shall be allowed in the project area. Direct impacts to San Joaquin pocket mice would be minimized in the Western powerline alignment under Power Option 2 by limiting project activities within iodine bush scrub and short grasslands habitat to the smallest possible extent. The implementation of Measure 4.6.7b, which provides habitat compensation for temporary and permanent impacts to annual	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
(4.6.15 continued)			grasslands that are potentially occupied by San Joaquin kit fox, would additionally benefit American badgers and San Joaquin pocket mice. **Measure 4.6.15b:** CCWD shall minimize impacts on special-status bats by performing preconstruction surveys and creating no-disturbance buffers around active bat roosting sites. Before construction activities (i.e., ground clearing and grading, including trees or shrub removal) within 200 feet of trees that could support special-status bats, a qualified bat biologist shall survey for special-status bats. If no evidence of bats (i.e., direct observation, guano, staining, or strong odors) is observed, no further mitigation shall be required. If evidence of bats is observed, CCWD and its contractors shall implement the following measures to avoid potential impacts on breeding populations: • A no-disturbance buffer of 250-feet shall be created around active bat roosts during the breeding season (April 15 through August 15). Bat roosts initiated during construction are presumed to be unaffected by the indirect effects of noise and construction disturbances. However, the direct take of individuals will be prohibited. • Removal of trees showing evidence of active bat activity shall occur during the period least likely to affect bats, as determined by a qualified bat biologist (generally between February 15 and October 15 for winter hibernacula, and between August 15 and April 15 for maternity roosts). If the exclusion of bats from potential roost sites is necessary to prevent indirect impacts due to construction noise and human activity adjacent, bat exclusion activities (e.g., installation of netting to block roost entrances) shall also be conducted during these periods. If special status bats are identified in the dam or special allowances must be made to relocate bats, CCWD will coordinate the effort in advance with CDFG.	
4.6.16: Draining the reservoir during project construction under Alternatives 1, 2, and 3 could affect Pacific Flyway species, including waterfowl and shorebirds.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS NI	None Required	No Impact Less Than Significant
4.6.17: The project would not result in conflicts with local and regional conservation plans, or local plans or ordinances protecting biological resources.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.6: Biological Resources (continued)				
4.6.18: Project construction would not make a cumulatively considerable contribution to cumulative effects on special-status species and habitats.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	Implementation of measures identified throughout this section to address project effects on terrestrial biological resources would also reduce the project's contribution to cumulative effects to a less-than significant level (4.6.1a, 4.6.1b, 4.6.2a, 4.6.2b, 4.6.3a, 4.6.3b, 4.6.4a, 4.6.4b, 4.6.5, 4.6.6a, 4.6.6b, 4.6.7a, 4.6.7b, 4.6.7c, 4.6.8a, 4.6.8b, 4.6.9a, 4.6.9b, 4.6.10a, 4.6.10b, 4.6.11, 4.6.12a, 4.6.12b, 4.6.14, 4.6.15a, and 4.6.15b). These measures would mitigate both direct and indirect impacts of the project alternatives.	No Impact Less Than Significant
Section 4.7: Land Use				
4.7.1: The proposed project and alternatives would not physically divide an existing community.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact
4.7.2: Facility siting and operation under the proposed project and alternatives would not conflict with any applicable land use plans.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.7.3: Construction activities within designated Airport Land Use Compatibility Zones near the Byron Airport could cause potential temporary height impacts by conflicting with FAR Part 77 surfaces during construction.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LS	**Measure 4.7.3:** Pursuant to ALUCP policy 4.3.4, CCWD shall notify the FAA, as required by FAR Part 77, Subpart B, of its proposed project to determine whether the proposed construction equipment and the location of construction activities and staging areas have the potential to intrude into protected airspace associated with Byron Airport. To facilitate FAA coordination, CCWD shall consult with County Airport staff. If necessary, CCWD will ensure that appropriate notes or modifications are made on all applicable design plans and specifications to ensure that construction activities would not conflict with the airport height limitations.	No Impact Less Than Significant
4.7.4: Construction activities within the AIA for Byron Airport could cause potential temporary flight hazards through the creation of glare or distracting lights; the generation of dust or smoke, which could impair pilot visibility; or could attract an increased number of birds.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.7.4a:** During project design, CCWD shall consult with Contra Costa County Airport staff regarding the location of illuminated equipment staging, storage, and construction areas, and the need to provide a potential Notice to Airmen (NOTAM) during construction activities. CCWD shall instruct its engineer to make appropriate notations on construction drawings and specifications to indicate that illuminated work areas shall incorporate the use of downward facing lights with amber lumens to prevent confusion to pilots.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.7: Land Use (continued)				
(4.7.4 continued)			**Measure 4.7.4b:** During project design, CCWD shall instruct its engineer to prohibit the use of temporary sediment ponds that could create open water to attract potentially hazardous wildlife. To ensure that an appropriate seed mixture is used during construction, CCWD shall instruct its engineer to make appropriate notations on construction drawings and specifications to indicate that all seed mixtures used for revegetation or for sediment and erosion control purposes should not contain rice, barely, millet, rye, or other potential food sources for avian wildlife. **Implementation of Air Quality Mitigation Measure 4.10.1:** During construction, CCWD will require the construction contractor to implement the Bay Area Air Quality Management District's (BAAQMD's) basic and enhanced dust control procedures (see Section 4.10, Air Quality)	
4.7.5: The proposed project and alternatives would not contribute to cumulative land use impacts.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact
Section 4.8: Agriculture				
4.8.1: Project construction would temporarily impact the agricultural use of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LS	**Measure 4.8.1:** To minimize temporary construction impacts to agricultural activities on Important Farmland, CCWD shall ensure that the following measures are incorporated into the project construction plans and specifications: • Ensure that the existing drainage systems at proposed project sites needed for farming activities function as necessary to avoid disrupting agriculture • Design dewatering operations to maximize dewatering in the immediate area of trench and to minimize drawdown area outside of trench during dewatering of construction trenches and other excavated areas; monitor soil moisture in adjacent crop fields to ensure adequate crop moisture and assist with irrigation scheduling • Locate construction access and staging areas in areas that are fallow and use existing roads to access construction areas to the extent possible • Coordinate construction scheduling as practicable to minimize disruption of agricultural operations by scheduling excavation before or after the growing season	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.8: Agriculture (continued)				
(4.8.1 continued)			• Minimize construction dust on crops by implementing Air Quality Measures 4.10.1 The above mitigation measures would reduce temporary construction impacts to less-than-significant levels.	
4.8.2: The project would permanently convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to nonagricultural use.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI SU SU LSM LS	**Measure 4.8.2a:** To support the continued productive use of Important Farmlands in the project area, CCWD shall ensure that the following measures are taken during project construction activities in Important Farmland: • Replace soils over pipelines in a manner that will minimize any negative impacts on crop productivity. The surface and subsurface soil layers will be stockpiled separately and returned to their appropriate locations in the soil profile. • Monitor pre-construction soil densities and return the surface soil (approximately the top 3 feet) to within 5 percent of original density so that over-compaction of the top layers of soil is avoided. • Rip the top soil layers, where necessary, to achieve the appropriate soil density. Ripping may also be used in areas, such as in construction staging locations, where vehicle and equipment traffic have compacted the top soil layers. • Minimize compaction and loss of soil structure by not working or traveling on wet soil. Before construction begins, geotechnical testing will be done to determine the moisture content limit above which work should not occur. Where working or driving on wet soil cannot be avoided, roadways will be capped with spoils that will be removed at the end of construction and/or ripped and amended with organic material as needed. • Remove all construction-related debris from the soil surface. This will prevent rock, gravel, and construction debris from interfering with agricultural activities. • Perform soil density monitoring during backfill and ripping to minimize excessive compaction and minimize effects on future agricultural land use. • Remove topsoil before excavating in fields. Return topsoil to top of fields to avoid detrimental inversion of soil profiles.	No Impact. Significant and unavoidable for Alternatives 1 and 2. These mitigation measures would reduce the impact of the proposed conversion of Farmland of Statewide Importance to nonagricultural uses, but not to a less-than-significant level. Less than Significant for Alternatives 3 and 4.

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.8: Agriculture (continued)				
(4.8.2 continued)			• Control compaction to minimize changes to lateral groundwater flow, which could affect both irrigation and internal drainage. **Measure 4.8.2b:** CCWD will provide the following mitigation for the conversion of Important Farmland: For each acre of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance that is permanently converted to nonagricultural use, 1 acre of agricultural conservation easement will be obtained. An agricultural conservation easement is a voluntary, recorded agreement between a landowner and a holder of the easement that preserves the land for agriculture. The easement places legally enforceable restrictions on the land. The exact terms of the easement are negotiated, but restricted activities will include subdivision of the property, non-farm development, and other uses that are inconsistent with agricultural production. The mitigation lands must be of equal or better quality (according to the latest available FMMP data) and have an adequate water supply. In addition, the mitigation lands must be within the same county. Information presented in Table 4.8-6 indicates that this compensatory mitigation would require acquisition of easements on about 22 acres of Farmland of Statewide Importance, preferably within Contra Costa County.	
4.8.3: The project would not conflict with zoning for agricultural use or a Williamson Act contract.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS NI	None Required	No Impact Less Than Significant
4.8.4: The project would involve changes in the environment that, due to their location or nature, could contribute to cumulative impacts from conversion of Important Farmland to nonagricultural uses.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI SU SU LSM LS	Implementation of Agricultural Resources Mitigation Measures 4.8.1 and 4.8.2 (a and b) would minimize potential impacts under Alternatives 1 and 2; however, those measures would not reduce cumulative impacts to less-than-significant levels. The level of significance after mitigation would be a significant and unavoidable cumulative impact for Alternatives 1 and 2. With Mitigation Measure 4.8.2a, Alternative 3 would not result in a cumulatively considerable contribution to a significant impact on agriculture.	No Impact Significant and Unavoidable for Alternatives 1 or 2; Less than Significant for Alternatives 3 and 4.
Section 4.9: Transportation and Circulation				
4.9.1: Project construction activities would intermittently and temporarily increase traffic congestion due to vehicle trips generated by construction workers and construction vehicles on area roadways.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LS	**Measure 4.9.1a:** Schedule project generated construction truck trips on Vasco Road, Byron Highway, SR 4, and SR 4 Bypass outside the peak morning and evening commute hours such that the frequency of construction truck trips on these roads would be no greater than one every two minutes (i.e., 30 trucks per hour) during these peak commute periods.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.9: Transportation and Circulation (continued)				
(4.9.1 continued)			**Measure 4.9.1b:** Develop and implement a construction truck hauling plan that designates specific routes to be used to access the various project facilities when multiple facility sites are under construction concurrently so that project-generated construction traffic is dispersed over a number of roads in the project area.	
4.9.2: Project construction activities under Alternatives 1, 2 and 3 would intermittently and temporarily impede access to local streets or adjacent uses, including access for emergency vehicles and could substantially increase traffic hazards due to construction in or adjacent to roads or possible road wear.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LS	**Measure 4.9.2a:** Maintain alternative property access or trench plates on site to restore access for emergency vehicles at all times. **Measure 4.9.2b:** Provide pre-notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways. **Measure 4.9.2c:** Install traffic control devices as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones where needed to maintain safe driving conditions. This measure includes the use of signage to alert motorists of construction activities, potential hazards and travel detours as well as the use of flaggers when appropriate. **Measure 4.9.2d:** Prior to construction, CCWD or its contractors will survey and describe the pre-construction roadway conditions on rural roadways and residential streets (including, but not limited to, Walnut Boulevard and Camino Diablo). Within 30 days after construction is completed, CCWD will survey these same roadways and residential streets in order to identify any damage that has occurred. Roads damaged by construction will be repaired to a structural condition equal to the condition that existed prior to construction activity.	No Impact Less Than Significant
4.9.3: Traffic associated with operation of project facilities, including the expanded recreation facilities, would not exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.9.4: Construction of project alternatives, when combined with construction of other future projects, could contribute to construction-related short-term cumulative impacts to traffic and transportation (traffic congestion, access, and traffic safety).	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LS	**Measure 4.9.4:** Prior to construction, CCWD will coordinate with the appropriate local government departments in Brentwood, Contra Costa County, Alameda County, and Caltrans, and with utility districts and agencies regarding the timing of construction projects that would occur near project sites. Specific measures to mitigate potential significant impacts will be determined as part of the interagency coordination, and could include measures such as employing flaggers during key construction periods, designating alternate haul routes, and providing more outreach and community noticing.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.10: Air Quality				
4.10.1: Construction of project alternatives could generate short-term emissions of criteria air pollutants: ROG, NOx, CO, and PM10 that could contribute to existing nonattainment conditions and further degrade air quality. However, project alternatives would not exceed federal general conformity *de minimis* standards for emissions.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.10.1:** During construction, CCWD will require the construction contractor to implement the measures that are specified under BAAQMD's basic and enhanced dust control procedures. These include: • Basic Control Measures – CCWD and its contractors will implement the following controls at all construction sites: - Water all active construction areas at least twice daily. - Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard. - Pave, apply water three times daily, or apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites. - Sweep daily (with water sweepers) all paved access roads, parking areas, and staging area at construction sites. - Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets. • Enhanced Control Measures – CCWD and its contractors will implement the following measures during project construction for project facility sites of 4 acres or greater: - Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas inactive for one month or more). - Enclose, cover, water twice daily, or apply (nontoxic) soil stabilizers to exposed stockpiles (such as dirt and sand). - Limit traffic speeds on unpaved roads to 15 miles per hour. - Install sandbags or other erosion control measures to prevent silt runoff to public roadways. - Replant vegetation in disturbed areas as quickly as possible. • CCWD and its contractors will implement the following additional control measure during reservoir expansion construction due to the large area of disturbance: - Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site onto public roads.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.10: Air Quality (continued)				
4.10.2: Operation of project alternatives would not result in emissions of criteria air pollutants at levels that would substantially contribute to a potential violation of applicable air quality standards or to nonattainment conditions.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.10.3: Construction and/or operation of project alternatives would not expose sensitive receptors to substantial pollutant concentrations.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.10.4: Operation of project alternatives would not create objectionable odors affecting a substantial number of people.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.10.5: Construction and operation of project alternatives would not result in a cumulatively considerable increase in greenhouse gas emissions.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.10.6: Construction and operation of the project alternatives could result in cumulatively considerable increases of criteria pollutant emissions.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	Implement Mitigation Measure 4.10.1.	No Impact Less Than Significant
Section 4.11: Noise				
4.11.1: Construction of facilities under the proposed project and alternatives could generate noise levels that exceed the Contra Costa County or Alameda County noise standards at nearby sensitive receptors if construction activities are carried out during noise-sensitive hours, causing sleep disturbance and/or annoyance.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.11.1a:** To avoid noise-sensitive hours of the day and night, construction will be limited to the hours between 7 a.m. to 7 p.m. Monday through Friday, and 8 a.m. to 5 p.m. on Saturday and Sunday for the following facilities, construction activities and project areas: • Alternatives 1, 2, 3, or 4: Construction of any facilities in those areas that are 3,000 feet or less from sensitive residences. At 3,000 feet, excavation activities would attenuate to 45 dBA and would be less than the quietest existing noise environment measured and depicted in Table 4.11-2 and would not be noticeable.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.11: Noise (continued)				
(4.11.1 continued)			**Measure 4.11.1b:** To further address the impact of construction for all alternatives, construction contractors will implement the following: • Signs will be posted at all construction site entrances to the property when project construction begins to inform all contractors/subcontractors, their employees, agents, material haulers, and all other persons at the applicable construction sites of the basic requirements of Mitigation Measures 4.11.1a, 4.11.1c, and 4.11.1d. • Signs will be posted at the construction sites that include permitted construction days and hours, a day and evening contact number for the job site, and a contact number in the event of problems. • An onsite complaint and enforcement manager will respond to and track complaints and questions related to noise. **Measure 4.11.1c:** To reduce noise impacts due to construction for all alternatives, construction contractors will be required to implement the following measures: • During construction, the contractor will outfit all equipment, fixed or mobile, with properly operating and maintained exhaust and intake mufflers, consistent with manufacturers' standards. • Impact tools (e.g., jackhammers, pavement breakers, and rock drills) used for construction will be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust will be used. External jackets on the tools themselves will be used where feasible. Quieter procedures, such as use of drills rather than impact tools, will be used whenever construction occurs within 3,000 feet of sensitive residences. • Stationary noise sources will be located as far from adjacent sensitive receptors as possible. **Measure 4.11.1d:** For all alternatives, no amplified sources (e.g., stereo "boom boxes") will be used in the vicinity of residences during project construction. **Measure 4.11.1e:** To further reduce less than significant pile driving noise impacts at the Delta Pump Station facilities under all alternatives, CCWD shall require construction contractors to implement "quiet" pile-driving technology (such as sonic or vibratory pile-driver use; pre-drilling of piles; jetted pile-driving) where feasible, with consideration of geotechnical and structural requirements and conditions.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.11: Noise (continued)				
4.11.2: Operation of the project and alternatives would generate traffic, stationary source, and area source noise similar to existing noise associated with operation of Los Vaqueros Reservoir system and would not exceed County noise requirements.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.11.3: Project construction would not expose persons to or generate excessive ground-borne vibration or ground-borne noise levels.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.11.4: The proposed project or alternatives would not make a cumulatively considerable contribution to noise levels during either construction or operation.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.12: Utilities and Public Service Systems				
4.12.1: Construction or operation of project alternatives could temporarily disrupt utilities and public service systems such that a public health hazard could be created or an extended service disruption could result.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Implementation of Transportation and Circulation Mitigation Measure 4.9.2:** This mitigation involves requirements to reduce the potential for impeding emergency access. **Implementation of Hazards Materials and Public Safety Mitigation Measure 4.13.3:** This mitigation involves required activities to reduce the potential risk of wildfires. **Measure 4.12.1a:** Prior to construction of the project facilities and once pipeline alignments have been finalized, a detailed survey identifying utilities along the proposed alignments will be conducted. The survey results and the following measures will be incorporated into final design plans and specifications to avoid or minimize potential conflicts with utilities: a. Utility excavation and encroachment permits will be acquired from the appropriate agencies, including the Public Works Departments of Contra Costa and Alameda Counties. CCWD will incorporate permit conditions in contract specifications that are designed to ensure no disruptions in service occur during construction. Contractors will be required to comply with permit conditions contained in contract specifications.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.12: Utilities and Public Service Systems (continued)				
(4.12.1 continued)			b. CCWD shall ensure that Underground Service Alert is notified at least 14 days prior to initiation of construction activities of the underground portions of each transmission lines and utility structures. Underground Service Alert verifies the location of all existing underground utilities and alerts the other utilities to mark their facilities in the area of anticipated construction activities. c. A detailed engineering and construction plan will be prepared as part of the design plans and specifications. This plan will include procedures for the excavation, support, and fill of areas around utility cables and pipes to ensure that utility cables are not damaged. All affected utility service providers will be notified of the construction plans and schedule, and arrangements will be made with these entities regarding the protection, relocation, or temporary disconnection of services. d. In shared utility easement areas where a project pipeline might parallel wastewater mains, the engineering and construction plans will include trench-wall support measures to guard against potential trench wall failure and the resulting loss of structural support for the wastewater main. e. The California Department of Health Services standards will be observed; these standards require: (1) a 10-foot horizontal separation between parallel sewer and water mains (gravity or force mains); (2) a 1-foot vertical separation between perpendicular water and sewer line crossings; and (3) encasing sewer mains in protective sleeves where a new water line crosses under or over an existing wastewater main. If the separation requirements cannot be maintained, a variance will be obtained from the Department of Health Services through the provision of sewer encasement or other means the department deems suitable. f. Final construction plans and specifications will be coordinated with affected utilities including PG&E, Western, and the California Department of Health Services Sanitary Engineering Branch. g. Emergency response plans and protocols, as required under construction permit conditions, shall be incorporated into project construction specifications. **Measure 4.12.1b:** CCWD shall phase construction to minimize the potential for water supply emergencies and complete formal arrangements with EBMUD for water supply backup prior to draining the Los Vaqueros Reservoir and initiating project construction.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.12: Utilities and Public Service Systems (continued)				
4.12.2: Project alternatives would not require or result in construction of new or expanded utility infrastructure or public service facilities that would result in substantial adverse physical impacts.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.12.3: Construction of the project alternatives could increase solid waste generation such that the capacity of local landfills would be exceeded or the project would not comply with state regulations related to solid waste.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.12.3:** CCWD will incorporate into the contract plans and specifications the requirement that the contractor implement solid waste reduction and debris recovery practices as developed by CCWD. The solid waste reduction / debris recovery specifications will include the following items. a. describe the planned management methods for all types of construction and demolition debris (e.g., reuse, recycling, or disposal), and indicate the types of debris expected to be generated by the project (e.g., wood, drywall, concrete, cardboard, and metal) b. name all service providers and/or facilities to be used for debris management (or indicate that the debris, such as dirt, will be reused onsite) c. demonstrate that at least 50 percent (by weight) of jobsite debris is diverted from disposal in a landfill by providing receipts and/or gate-tags from all facilities and service providers used to recycle, reuse, or dispose of jobsite debris. Project waste generation would be avoided or minimized in a number of ways, which would be outlined in the project's solid waste reduction / debris recovery plan, and incorporated into project plans and specifications for implementation by contractors selected to complete project construction. To reduce solid waste generation, a series of practices would be developed, as follows: *Re-use of excavation backfill*. Fill materials excavated during project grading and drilling would be reused as fill materials during project construction, while soils excavated during pipeline construction would be used to backfill trenches after pipeline installation; *Recycling of materials*. Some construction materials, including some wood scraps, metals, and packaging materials could be recycled for later resale e.g. – wood scraps sold as landscape mulch. *Re-Use of excess fill*. Clean fill could be accepted for use at other construction sites, or stored at existing sand and gravel facilities until (re)used as clean fill.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.12: Utilities and Public Service Systems (continued)				
(4.12.3 continued)			<u>Roadway sub-base or surface material</u>. Larger waste rock from excavation of tunnels would be placed along project access roads as a roadway sub-base or surface. <u>Divert waste to non-landfill locations</u>. Additional amounts of the larger waste rock could be disposed of at a 22-acre area near the terminus of Byron Hot Springs Road.	
4.12.4: Construction of the project alternatives could make a cumulatively considerable contribution to cumulative effects on public services and utilities, or local landfill capacity.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	Implementation of Mitigation Measures 4.12-1 and 4.12-3, including implementation of a solid waste reduction / debris recovery plan as required under AB 939, will reduce potential cumulative impacts to less-than-significant levels.	No Impact Less Than Significant
Section 4.13: Hazardous Materials / Public Health				
4.13.1: Construction of the project and alternative components would disturb subsurface soils and groundwater; if hazardous substances are present in the disturbed areas, construction workers and the public could be exposed to these substances.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.13.2: Project construction and operation could, through routine transport, use or disposal, accidentally release hazardous materials, thereby exposing construction workers, project personnel, and the public to hazardous materials, or accidentally releasing hazardous materials into the soil, groundwater, and/or a nearby surface water body.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Implementation of Hydrology Mitigation Measures 4.5.1a and 4.5.1b:** These measures involve protection of water quality. **Measure 4.13.2:** CCWD will incorporate into the contract specifications that require the contractor to enforce strict onsite best management practices (BMPs) to keep hazardous materials from accidental release. These practices will include, without limitation, designating a central storage area to keep hazardous materials away from any waterways and storm drain inlets; refueling equipment in designated areas; containing contaminants away from any waterways or storm drain inlets; preparing a spill prevention, control, and countermeasure plan; and regularly inspecting construction vehicles for leaks.	No Impact Less Than Significant
4.13.3: Improper handling or use of flammable or combustible materials such as internal combustion equipment could result in wildland fires, exposing people or structures to a significant risk of loss, injury, or death.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.13.3:** CCWD will incorporate into contract specifications the requirement that the contractor enforce strict onsite BMPs to reduce the potential for accidental fires. 1) All equipment used during construction must have an approved spark arrestor.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.13: Hazardous Materials / Public Health (continued)				
(4.13.3 continued)			2) The contractor/staff responsible for construction will submit a Fire Safety Plan for review by the Contra Costa County Fire Prevention Bureau. This plan will include precautions to carry out during high-fire danger, a list of fire-suppression equipment and tools to have on hand, a description of available communications, specifications for the supply of water to have on hand, and descriptions of other actions that will reduce the risk of ignition and facilitate immediate control of an incipient fire. 3) Ensuring easily accessible fire-suppression equipment is available at all work locations.	
4.13.4: Construction and operation of project power supply facilities would not locate electrical transmission facilities within 150 feet of a school.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact
4.13.5: The project alternatives would not contribute to cumulative impacts associated with release of hazardous materials or other hazards.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.14: Visual/Aesthetic Resources				
4.14.1: The project alternatives would not have a substantial, demonstrable negative aesthetic effect on a scenic vista or from a county-designated scenic highway or route.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.14.2: The project alternatives would not substantially degrade the existing visual character or quality of the site and its surroundings, except Alternative 4 due to the borrow area in Kellogg Valley.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LSM	**Measure 4.14.2a:** CCWD shall develop and implement a site restoration plan specifically for the 160 TAF borrow area that shall provide for finished topography that, while not restored to prior condition, shall blend in with the surrounding landscape, minimizing the visual contrast. The plan shall include a revegetation plan that includes a native seed mix typical of the surrounding area. While these site restoration steps are similar to those that will be required at all project sites, this specific project area requires its own restoration plan because of the extent of ground disturbance that will occur here.	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.14: Visual/Aesthetic Resources (continued)				
4.14.3: The project alternatives would not create a new source of substantial light but Alternatives 1, 2, and 3 could create a new source of substantial glare that could adversely affect views in the area.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LS	**Measure 4.14.3:** Non-specular conductors shall be installed to reduce the potential glare effects and the level of visual contrast between the transmission line and its landscape setting.	No Impact Less Than Significant
4.14.4: The project alternatives would not make a cumulatively considerable contribution to adverse effects on visual/aesthetic resources in the project area or broader region.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.15: Recreation				
4.15.1: Construction of the project alternatives would result in a short-term reduction of recreational opportunities in the project area due to construction activities outside the watershed and closure of the watershed to the public during the construction period, but would enhance recreational opportunities in the long-term.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.15.1a:** Before any recreational facilities are closed in the watershed, CCWD shall prepare and implement a public outreach program and promote the program via the web, billing inserts, and other methods to inform current and potential recreational users of the temporary closure of the Los Vaqueros Reservoir day-use facilities and inform customers of other recreational opportunities in the area. **Measure 4.15.1b:** If EBRPD's proposed Delta Trail Extension is developed and open to the public before or during construction of the new Delta Intake and Pump Station, CCWD shall provide EBRPD with an anticipated closure schedule; prepare and implement a public outreach program and promote the program via the web, billing inserts, and other methods to inform current and potential recreational trail users of the temporary closure of the Delta Trail Extension and inform customers of other recreational trail opportunities in the area; and place signage to the north and south of the new Delta Intake and Pump Station site along the trail to inform recreational users of the trail closure, alternative trail options, and anticipated timing for the reopening.	No Impact Less Than Significant
4.15.2: The project alternatives would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.15.3: No other reasonably foreseeable future projects would also reduce recreational opportunities in the project area, similar to those opportunities affected by the project alternatives, or increase the use of existing	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.15: Recreation (continued)				
(4.15.3 continued) neighborhood and regional parks or other recreational facilities; therefore, there does not appear to be the potential for the project alternatives to contribute to a cumulative effect on recreation facilities, opportunities or experience.				
Section 4.16: Cultural and Paleontological Resources				
4.16.1: Construction and management of project components would cause a substantial adverse change in the significance of a historical and/or unique archaeological resource as defined in Section 15064.5 or historic property or historic district, as defined in Section 106 of the NHPA (36 CFR 800), or in a previously undiscovered cultural resource.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	Under both federal and state law, the first mitigation measure to be considered for a significant impact to a cultural resource is relocation of project elements so that the impact is avoided. For all project alternatives, some project elements could not be relocated to avoid impacts on cultural resources. **Measure 4.16.1a: *Los Vaqueros Reservoir Expansion; Dam Modification; and Other Sites Where Cultural Resources Can Be Avoided***. The preferred mitigation measure under CEQA is site avoidance. If feasible, avoid impacts to known cultural resources through project design modification. Using GIS mapping techniques, overlay project design plans on boundary maps of known cultural resources and redesign project components to avoid significant cultural resources by ensuring they fall into areas designated as open space or otherwise undeveloped areas. This is the least costly mitigation measure and is favored by archaeologists, local historical societies, and Native American groups. **Measure 4.16.1b: *Los Vaqueros Reservoir Expansion; Dam Modification; and Other Sites Where Cultural Resources Cannot Be Avoided***. If feasible, protect cultural resources in place. If resources cannot be protected in place, implement data recovery consistent with 14 CCR § 15126.4(b)(3)(c) and with the guidelines set forth in the Secretary of Interior's standards and guidelines (Standards I through IV). CCR § 15126.4(b)(3)(c) states that a data recovery plan shall be prepared and adopted prior to any excavation being undertaken. Because the historical significance of most archaeological sites lies in their potential to contribute to scientific research, the data recovery plan shall make provision for adequately recovering the scientifically consequential data from and about the historical resource. Similarly geared toward scientific inquiry, the Secretary of Interior's standards include following an explicit statement of objectives and employing methods that respond to needs identified in the planning process; using	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative	Mitigation Measure	Significance After Mitigation
Section 4.16: Cultural and Paleontological Resources (continued)			
(4.16.1 continued)		methods and techniques of archaeological documentation (data recovery) selected to obtain the information required by the statement of objectives; assessing the results of the archaeological documentation against the statement of objectives and integrating them into the planning process; and reporting and making public the results of the archaeological documentation. To this end, data recovery findings shall be documented in a data recovery report, which shall follow guidelines set forth by SHPO for such reports. **Measure 4.16.1c: *Los Vaqueros Reservoir Expansion; Dam Modification; Marina Access Road; Inlet/Outlet Pipelines; Western Hiking Trail/Access Road; Delta-Transfer Pipeline; Transfer-LV Pipeline; and Transfer-Bethany Pipeline.*** Prior to ground disturbing activities, conduct subsurface investigations (i.e., archeological testing) for undiscovered cultural resources in the portions of the APEs for the project elements that are identified as having moderate to high potential for undiscovered subsurface cultural resources. Conduct data recovery as described in Mitigation Measure 4.16.1b. **Measure 4.16.1d: *All project elements near known cultural resources or in areas with high potential for undiscovered cultural resources.*** During construction, restrict ground-disturbing activities to the minimum area feasible and fence off known cultural resources and high-potential areas that are outside but near the construction area. To prevent construction-related adverse impacts on historic properties within the APE, CCWD shall instruct its contractors to place fencing or other barriers around sites that could be affected. CCWD shall prepare and implement a cultural resource construction monitoring plan to ensure that monitoring and/or physical barriers adequately protect sites from incidental construction activities. For example, the petroglyph boulder (CA-CCO-597) that is within the APE for the Transfer-Bethany Pipeline shall be fenced during construction, thereby creating a 20-foot-wide buffer to ensure that heavy equipment traffic and staging- and storage-related activities do not cause inadvertent damage to the property. **Measure 4.16.1e: *All project elements.*** All construction personnel who work on the project shall undergo a training session to inform them of the presence and nature of cultural resources and human remains within the project area; of the laws protecting these resources and associated penalties; and of the procedures to follow if they discover cultural resources during project-related work. **Measure 4.16.1f: *All project elements.*** If previously undiscovered cultural resources (e.g., unusual amounts of shell, animal bone, bottle glass, ceramics, structure/building remains, etc.) are discovered during ground-	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.16: Cultural and Paleontological Resources (continued)				
(4.16.1 continued)			disturbing activities, CCWD shall authorize the construction contractor to stop work in that area and within 100 feet of the find until a qualified archaeologist can assess the significance of the find according to NRHP and CEQA (including CRHR) criteria, and, if necessary, develop appropriate treatment measures in consultation with CCWD. Potential treatment measures for significant and potentially significant resources may include, but would not be limited to, no action (i.e., resources determined not to be significant), avoidance of the resource through changes in construction methods or project design, and implementation of a program of testing and data recovery, in accordance with PRC § 21083.2. Implementation of this mitigation measure would ensure proper identification and treatment of any significant cultural resources uncovered as a result of project-related ground disturbance and would reduce the potential impact resulting from inadvertent damage or destruction of unknown cultural resources during construction to a less-than-significant level. **Measure 4.16.1g:** Impacts on some sites from increased access and vandalism can be minimized by updating the existing Cultural Resources Management Plan. The plan was developed for the original Los Vaqueros Project and it should be updated for the proposed project. To ensure the long-term protection of these sites, the existing plan provides guidelines to prevent impacts on historic properties, such as restrictions for use in areas of sensitivity, and a long-term monitoring program to ensure that cultural resources are protected in the future. The plan states that should vandalism be detected during the long-term monitoring program, a plan should be in place to organize the documentation and investigation of the endangered resource. Such an HPTP would entail elements including complete photographic and mapping documentation of the resource, as well as a phased archaeological testing and data recovery program. Such an HPTP shall be developed for each historic property that is determined to be visible from trails, exposure due to erosion, and vulnerable to vandalism for the proposed project. **Measure 4.16.1h:** Results from the recordation, testing, and data recovery of the prehistoric and historic-era resources within the District shall be synthesized into a comprehensive scholarly study of the prehistory and history of the District. Particular attention shall be paid to the change in use through time of the lower elevations of the watershed and resources therein within the context of the greater watershed. Additionally, the same information shall be synthesized into a document for public education that can be easily accessed and understood by members of the public including children of grade-school age.	

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.16: Cultural and Paleontological Resources (continued)				
4.16.2: Ground-disturbing activities could encounter and destroy paleontological resources in certain geologic formations underlying the project area.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.16.2a:** A trained paleontologist shall monitor the earth disturbing activities in areas of high and very high sensitivity. If a paleontological resource is encountered during excavation monitoring, the onsite monitor shall halt or divert excavations within 50 feet of the find until the discovery is examined by the monitor in accordance with Society of Vertebrate Paleontology standards. If the resource is determined not to be significant, construction shall resume. If the resource is determined to be significant, construction shall remain halted and the paleontologist shall prepare and implement a salvage plan in accordance with Society of Vertebrate Paleontology standards to recover, remove and/or mold exposed paleontological resources and conduct sampling where necessary to recover microfossil remains (Society of Vertebrate Paleontology, 1995). The paleontologist shall notify CCWD and Reclamation if the find is determined to be significant. **Measure 4.16.2b:** Prior to the start of construction on project elements that would require earth disturbing activities in areas of low or moderate paleontological sensitivities, construction personnel involved with earth-moving activities shall be trained regarding the appearance of fossils and proper notification procedures. This worker training shall be prepared and presented by a qualified paleontologist. If workers discover paleontological resources during ground-disturbing activities, work shall stop within 50 feet of the find until a qualified paleontologist can assess the significance of the find and determine the appropriate next steps, depending on the significance of the find as described in Measure 4.16.2a.	No Impact Less Than Significant
4.16.3: Construction and management of project components could disturb human remains, including those interred outside of formal cemeteries.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	**Measure 4.16.3:** ***Stop Potentially Damaging Work if Human Remains Are Uncovered During Construction, as a Result of Erosion, or of Vandalism, Assess the Significance of the Find, and Pursue Appropriate Management.*** California law recognizes the need to protect interred human remains, particularly Native American burials and associated items of patrimony, from vandalism and inadvertent destruction. The procedures for the treatment of discovered human remains are contained in California Health and Safety Code §7050.5 and §7052 and California PRC §5097. In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, including construction, erosion, or vandalism, all such activities within a 100-foot radius of the find shall be halted immediately and CCWD's designated representative shall be notified. CCWD shall immediately notify the county coroner and a qualified professional archaeologist. The coroner is required	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.16: Cultural and Paleontological Resources (continued)				
(4.16.3. continued)			to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If death appears to have resulted from homicide, suicide, poisoning, accident, violence, or certain contagious diseases and hazards, the coroner is required to investigate as specified in Government Code Section 27491. If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). CCWD's responsibilities for acting upon notification of a discovery of Native American human remains are identified in detail in the California PRC Section 5097.98. CCWD or its appointed representative and the professional archaeologist shall contact the Most Likely Descendent (MLD), as determined by the NAHC, regarding the remains. The MLD, in cooperation with the property owner and the lead agencies, shall determine the ultimate disposition of the remains in accord with the provisions of Section 5097.98. If NAHC cannot identify any MLDs, if the MLD fails to make a recommendation, or CCWD disagrees with the MLDs recommendation and mediation fails to resolve the issue, then CCWD must reinter the human remains with appropriate dignity on a part of the property not subject to further subsurface disturbance, as is specified in Section 5097.98(b) and 14 Cal. Code Regs § 1064.5(e)(2).	
4.16.4: Construction and management of project components would contribute to adverse cumulative impacts to cultural and/or paleontological resources.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LSM LSM LSM LSM	Measures 4.16.2a and 4.16.2b, as previously stated.	No Impact Less Than Significant
Section 4.17: Socioeconomic Effects				
4.17.1: Project construction could temporarily generate new income and local employment that could benefit Contra Costa County's economy.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI B B B B	None Required	No Impact Beneficial
4.17.2: Loss of agricultural land use associated with project construction and development could affect Contra Costa County and Alameda County's economy.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.17: Socioeconomic Effects (continued)				
4.17.3: Short-term loss of recreation income associated with project construction could affect Contra Costa County's economy.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.17.4 Construction of the project alternatives, when combined with construction of other future projects, could have a potentially beneficial effect on income and local employment.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI B B B B	None Required	No Impact Beneficial
4.17.5: Construction of the project alternatives, when combined with construction of other future projects, could have a potential cumulative effect on Contra Costa County's economy as a result of temporary loss of agricultural land uses.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI SU SU LS LS	**Implementation of Agricultural Resources Mitigation Measures 4.8.1 and 4.8.2 (a and b):** This would minimize potential impacts under Alternatives 1 and 2; however, those measures would not reduce cumulative impacts to less than significant levels. The level of significance after mitigation would be a significant and avoidable cumulative impact.	No Impact Significant and Unavoidable for Alternatives 1 or 2; Less than Significant for Alternatives 3 and 4.
4.17.6 Construction of the project alternatives, when combined with construction of other future projects, could have a potential cumulative effect on Contra Costa County's economy as a result of temporary recreational impacts.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
Section 4.18: Environmental Justice				
4.18.1: Construction and operation of the project alternatives would result in air quality, noise, and/or other environmental impacts related to traffic and other construction activities that would not disproportionately affect nearby minority and/or low-income communities.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.18.2: Construction and operation of the project alternatives would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact

TABLE ES-7 (Continued)
CEQA ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Environmental Impact	Impact to Alternative		Mitigation Measure	Significance After Mitigation
Section 4.18: Environmental Justice (continued)				
4.18.3: Construction and operation of the project alternatives when combined with construction of other past, present, and probable future projects, would result in air quality, noise, and/or other environmental impacts related to traffic and other construction activities that would not disproportionately affect nearby minority and/or low-income communities.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI LS LS LS LS	None Required	No Impact Less Than Significant
4.18.4: Construction and operation of the project, when combined with construction of other past, present, and probable future projects, would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact
Section 4.19: Indian Trust Assets				
4.19.1: The project would not affect Indian Trust Assets.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact
Section 4.20: Growth-Inducing Effects				
4.20.1: Construction and operation of the proposed project would not result in direct or indirect growth-inducing effects.	No Action: Alternative 1: Alternative 2: Alternative 3: Alternative 4:	NI NI NI NI NI	None Required	No Impact

CHAPTER 1

Purpose, Need and Objectives for the Los Vaqueros Reservoir Expansion Project

1.1 Introduction

The San Francisco Bay/Sacramento–San Joaquin Delta estuary is the largest estuary on the West Coast and provides essential habitat for a diverse array of fish and wildlife. It is also the critical hub in the conveyance of drinking water supplies to more than two-thirds of the California population and irrigation supplies to 7 million acres of agricultural lands.

In response to worsening ecological conditions and increasing risk to water supplies, the Governor of California assembled a Blue Ribbon Task Force to develop “a durable vision for sustainable management of the Delta” with the goal of “…managing the Delta over the long term to restore and maintain identified functions and values that are determined to be important to the environmental quality of the Delta and the economic and social well-being of the people of the state.” The Task Force issued its Delta Vision report in December 2007, followed by the Delta Vision Strategic Plan in October 2008, both emphasizing the need to manage the Delta to two co-equal goals - restoring the Delta ecosystem and creating a more reliable water supply for California (Delta Vision Blue Ribbon Task Force, 2007 and 2008). This state-initiated planning process, known as Delta Vision, builds and expands upon the work of the CALFED Bay-Delta Program (CALFED).

CALFED, a consortium of state and federal agencies with resource management and regulatory responsibilities in the Bay-Delta estuary, was formed in the mid-1990s to develop “a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system” (CALFED, 2000). The CALFED planning phase culminated with publication of the Final Programmatic EIS/EIR on the proposed CALFED Bay-Delta Program in July 2000 and issuance of the federal Record of Decision (ROD) in August 2000. Implementation proceeded in twelve program areas including ecosystem restoration, water supply reliability, storage, conveyance and the Environmental Water Account (EWA). Expansion of the existing Los Vaqueros Reservoir (the reservoir), owned and operated by Contra Costa Water District (CCWD), is one of five surface water storage projects identified for further investigation in the CALFED Storage Program.

The planning phase of the Los Vaqueros Reservoir Expansion Project began in January 2001, managed by CCWD and supported and funded by the U.S. Department of Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) and the California Department of Water Resources (DWR). After preliminary planning studies demonstrated that the proposed expansion project could result in environmental, water supply reliability and water quality benefits, voters in CCWD's service area were asked to vote on whether CCWD should consider expansion of its reservoir. The 2004 advisory ballot measure won approval of 62 percent of the voters. Since the vote, the proposed expansion project has been further developed and refined through detailed studies and extensive public outreach.

The Los Vaqueros Reservoir is an off-stream storage reservoir near the Delta. CCWD currently pumps water from the Delta into this 100-thousand-acre-foot (TAF) capacity reservoir through state-of-the-art, positive barrier fish screens. Having this storage capacity allows CCWD to improve the water quality delivered to its customers and to adjust the timing of its Delta water diversions throughout the year to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment.

Expansion of the reservoir and related facilities would provide an opportunity to expand these benefits and improve related system reliability and flexibility, furthering the goals of Delta Vision and CALFED through a cooperative effort among CCWD and project participants. Through the use of the expanded reservoir and related facilities, along with existing CCWD facilities and assets, and through coordinated operations with the State Water Project (SWP) and Central Valley Project (CVP), fishery protection and Bay Area water supply reliability can be substantially improved.

The four project alternatives evaluated here all include an enlarged Los Vaqueros Reservoir and the related facilities to operate the reservoir. Two of the alternatives include a South Bay Connection, which would be accomplished through construction of a new Delta intake and pump station and a conveyance pipeline connecting the Los Vaqueros Reservoir facilities to three Bay Area water agencies: Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7), Alameda County Water District (ACWD) and Santa Clara Valley Water District (SCVWD), all of which receive SWP water through the South Bay Aqueduct. SCVWD also receives CVP water. Depending on which, if any of the alternatives is ultimately approved, such a project could reduce impacts to Delta fisheries resulting from SWP and CVP operations, provide water to improve environmental conditions in the Delta and its associated tributary rivers and wetlands, and improve water supply reliability for Bay Area water users.

A decision to approve any of the project alternatives requires compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). CCWD is the CEQA lead agency and Reclamation is the federal NEPA lead agency. State CEQA Guidelines require that an EIR provide a clearly written statement of the purpose of a proposed project. Section 15124 (b) of the state CEQA Guidelines requires a statement of the project objectives, including the underlying purpose of the project. NEPA regulations require a statement of "the underlying purpose and need to which the agency is responding in proposing the alternatives, including the proposed action" (40 CFR 1502.12).

1.2 Project Objectives

The Los Vaqueros Reservoir Expansion Project objectives are to use an expanded Los Vaqueros Reservoir system to:

Primary Objectives:

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.
- Increase water supply reliability for water providers within the San Francisco Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

- Improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

In addition to these objectives, CCWD Board of Directors' Resolution No. 03-24 provides important guidance for identifying and evaluating plans involving the expansion of the reservoir (CCWD, 2003). The CCWD Board Principles are discussed in detail in Chapter 2.

1.3 Purpose and Need

The primary project purpose is to use an expanded Los Vaqueros Reservoir system to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs in the Delta and tributary river systems, and to improve water supply reliability for urban users in the San Francisco Bay Area.

The need for this project is driven by the following conditions:

- The Delta ecosystem is in a state of serious decline, with primary productivity very low and fish populations decreasing to record low levels, putting at least one species (the delta smelt) on the brink of extinction.
- Insufficient quantities of water and lack of storage and flexibility in managing the timing and location of diversions for environmental and municipal water supplies are contributing to the ecosystem's decline.
- Ecosystem decline has put other beneficial uses of water supplies conveyed through the Delta at risk, leading to court-ordered limits on Delta pumping and greatly reducing water supply reliability for millions of people.

Improved storage and conveyance of environmental water supplies can help to improve Delta ecosystem conditions and reduce conflict among beneficial uses of Delta water supplies.

1.4 Background on Need for Project

1.4.1 The Delta Supports Multiple Beneficial Uses

The Sacramento–San Joaquin Delta is an area of transition between the freshwater runoff from the Sacramento and San Joaquin Rivers and the tidally driven saltwater flows from the Pacific Ocean and San Francisco Bay. The San Francisco Bay/Sacramento–San Joaquin Delta estuary is the largest estuary on the West Coast. It is a complex system of rivers, sloughs, islands, open water areas, and constructed features such as barriers, tide gates, and water diversion pumps. A number of smaller tributaries also flow into the Delta. Additional inflows derive from agricultural and municipal wastewater discharges within the Delta and upstream.

The Delta is critical to California's economy, supplying drinking water for more than two-thirds of Californians and irrigation water for about 7 million acres of highly productive agricultural land. The Delta is also a key component of California's two largest water distribution systems: the CVP, operated by Reclamation, and the SWP, operated by DWR. Both the federal and state systems pump water out of the southwestern Delta to agricultural and urban contractors in the Bay Area and in central and southern regions of the state.

The Bay and Delta are habitat for a rich ecosystem of aquatic, terrestrial, and avian species, including more than 30 species protected under federal and state regulations. The aquatic habitat supports anadromous fish such as chinook salmon and steelhead trout that pass through the Delta on their way to the ocean and back to upstream rivers to spawn, as well as many resident species such as delta smelt that live their entire lives in the Delta. All these species are susceptible to flow and water quality conditions in the Delta. Additionally, the Delta supports an extensive sport and commercial fishery.

1.4.2 Declining Delta Ecosystem

Annual monitoring of fish abundance since 2000 includes record lows of delta smelt and young striped bass, and near-record lows of longfin smelt and threadfin shad (Resources Agency, 2007). In its January 2008 progress report, the Pelagic Organism Decline work team wrote: "Although several species show evidence of long-term declines, the recent low levels were unexpected given the relatively moderate winter-spring flows of the past several years" (Baxter, et al, 2008). The decline in multiple species with different life histories makes the changes during this period particularly concerning. Low abundance of these species remained through 2006 despite moderate to wet hydrologic conditions (Baxter, et al, 2008).

Many factors have been cited for the decline of the Delta ecosystem generally, and for fish species in particular including: invasive species; low primary productivity (phytoplankton); increasing temperatures; reduced and altered timing of inflows to the Delta; increased and altered timing of exports from the Delta; declining water quality due to increased discharges from wastewater treatment plants, agricultural drains, industrial operations, and non-point sources; changes in physical and chemical parameters such as flow and salinity; and loss of wetlands and floodplains to urbanization and agricultural land conversion (see, e.g., Healey, 2007 and Baxter, et al, 2008).

On December 14, 2007, U.S. District Court Judge Oliver Wanger issued an Interim Order curtailing water exports from the Delta to protect delta smelt, a native species on the brink of extinction (NRDC, *et al* v. Kempthorne, *et al,* U.S. District Court, Eastern District of California, No. 1:05-cv-1207 OWW GSA). In this order, Judge Wanger set flow requirements designed to prevent extinction of delta smelt and avoid adverse modification of critical habitat. Meeting the flow requirements has necessitated CVP and SWP pumping curtailments that reduce the reliability of water supplies delivered to urban and agricultural water users dependent on these pumps. The CVP and SWP pumping reductions ordered in this decision were part of interim actions to protect fish until a new biological opinion could be issued by the U.S. Fish and Wildlife Service (USFWS) (Delta Export Restrictions). That biological opinion was issued on December 15, 2008 (USFWS, 2008).

The analyses pertaining to operation of the SWP and CVP in this document are based on the Interim Order and the 2004 plan for coordinated operations of the SWP and CVP, known as the Operations Criteria and Plan. Once a new opinion on salmon and steelhead is issued by the National Marine Fisheries Service (NMFS) (expected in mid-summer 2009), Reclamation and DWR intend to complete an analysis of the effects that the new biological opinions will have on the operation of the SWP and CVP. It is possible that the new opinions may result in moderate to severe fishery restrictions being imposed on Delta exports, depending on annual hydrologic conditions, above and beyond those caused by the Interim Order. The analysis of the effects of the new biological opinions on operations of the SWP and CVP will be described in the Final EIS/EIR for this project.

1.4.3 Insufficient Water Supply for Environmental Purposes

Public Law 102-575, the CVP Improvement Act (CVPIA), was enacted in 1992 to "protect, restore, and enhance fish, wildlife and associated habitats in the Central Valley and Trinity River basins of California" as well as to improve the operations flexibility of the CVP. It contains numerous requirements to modify CVP operations to ensure in-stream flows, carry-over storage, and temperature control to protect and restore, in particular, anadromous fisheries.

During dry periods, the CVP has difficulty meeting these requirements while still meeting contractual water supply obligations. As stated above, additional protective measures may be required in the new biological opinion being prepared by NMFS to address the effects of operation of the CVP and SWP on salmon and steelhead. The new opinion was required by the 2008 court decision in *Pacific Coast Federation of Fishermen's Associations v. Gutierrez* which invalidated the 2005 biological opinion. The new opinion is expected in mid-summer 2009.

One of the specific actions required under the CVPIA is provision of "firm water supplies of suitable quality to maintain and improve wetland habitat areas on units of the National Wildlife Refuge System in the Central Valley of California" (CVPIA Section 3406(d)(1)). The CVPIA required about 430 TAF of CVP yield be delivered as base refuge supply. These arrangements were addressed in long-term contracts between Reclamation and the Grassland Resource Conservation District, the California Department of Fish and Game and the USFWS.

The Act also set a target for supplying an additional 130 TAF of Incremental Level 4 refuge water within 10 years. This water was to be acquired through measures that do not require involuntary reallocations of CVP yield. Reclamation, in cooperation and coordination with the USFWS, implements the CVPIA Water Acquisition Program to acquire supplies to meet this and other environmental water requirements under the CVPIA. The program attempts to purchase or otherwise acquire as much of the target supply of 130 TAF as is available on the water market, to the extent of available funds, to meet optimal waterfowl habitat management needs and to support in-stream flows. The program purchases water through both short and long-term agreements, relying on market mechanisms to acquire water assets.

Reclamation has been able to secure some, but not all, of the supplemental refuge water supply for these wetland habitat areas (Reclamation, 2006). Constraints in meeting the target include budget constraints, cost and availability of water, pumping capacity at the Delta facilities, storage, and conveyance infrastructure.

1.4.4 Lack of Management Flexibility

The existing state and federal water systems lack flexibility in terms of when, where, and how water is pumped from the Delta. This lack of flexibility adds to the difficulty of addressing fish impacts, ecosystem decline, and supply reliability problems. CALFED's EWA Program is an example of an environmental water program aimed at protecting Delta fish species by increasing flexibility in SWP and CVP operations. The EWA has operated since 2001 and has been authorized by Congress through September 30, 2010. The EWA is intended to provide water "to augment streamflows, Delta outflows, to modify exports to provide fishery benefits and to replace the regular project water supply interrupted by the changes to project operations." (CALFED, 2000)

EWA performance was evaluated by CALFED in 2007. An important finding about the existing EWA program that could be applied to future EWA or other environmental water programs was that the lack of storage for EWA water assets south of the Delta is a serious constraint on EWA management and affects the ability to make the best use of the water for environmental purposes (CALFED, 2007). Additional storage capacity, along with the means to fill that storage without relying on the SWP and CVP Delta pumps, and to convey the stored water to offset Delta export curtailments, would substantially benefit the management of environmental water in the Delta and provide improved fishery conditions over and above those required by permits.

1.4.5 Decreasing Supply Reliability

Bay Area water agencies rely heavily on water supplies conveyed through the Delta to meet their normal year demands as well as prepare them for drought periods. CCWD customers receive almost 90 percent of their supply from the Delta while the three South Bay water agencies that receive SWP water – ACWD, SCVWD and Zone 7 – each receive about 40 to 65 percent of their supply from the Delta (ACWD, 2005; SCVWD, 2005; Zone 7, 2005). All of these agencies have long-term water supply plans to provide for their customers into the future under normal conditions and during extended droughts and emergencies. Each agency has a diversified water supply portfolio including resource management strategies such as increased conservation, water recycling, desalination of brackish groundwater, and water banking.

ACWD, SCVWD, and Zone 7 also each have local groundwater basins that provide additional storage for conjunctive use of surface water. Local groundwater supply and storage gives these three agencies valuable flexibility and time to respond to droughts and emergencies. Still, Delta water remains an essential component of each of their water supply plans.

In the San Francisco Bay Area, water supply reliability can be adversely affected by the effects of droughts and emergencies, and by regulatory actions taken to protect Delta fish that result in constraints on pumping water from the Delta. For example, in February 2008, DWR notified SWP contractors that they would receive just 35 percent of their requested supplies in 2008. The allocation, which is significantly less than the 60 percent of requested supplies initially projected for calendar year 2008, takes into consideration current water supply conditions and SWP operational constraints, including the federal court-ordered 2008 Delta Export Restrictions to protect delta smelt.

The level of Delta supply reduction resulting from both dry-year conditions and regulatory actions experienced in 2008 will greatly affect the Bay Area water supply agencies if it extends to multiple years, such as occurred during the droughts of 1928 through 1935, 1976 through 1977, and 1987 through 1992. Local supplies, such as groundwater and locally stored runoff, drop during extended dry periods. At the same time, SWP deliveries can be reduced from an average of 63 percent of the contracted water supply (SWP Table A[1]) to about 6 percent of the contracted water supply during a single dry year with conditions similar to those in 1977 (DWR, 2008). A 4-year drought, similar to the period of 1931 to 1934, with the 2008 Delta Export Restrictions in place, would result in reductions of SWP deliveries to about 34 percent of full Table A deliveries.

Other factors also can limit water supply. Catastrophic emergency events with the potential to affect the Delta and the delivery of Delta water supplies include earthquakes, chemical spills, levee failures, and other events that have the potential to disrupt individual or multiple water conveyance facilities such as aqueducts, tunnels, and pump stations. More than 1,100 miles of levees, mostly un-engineered earthen berms, are deteriorating. This deterioration increases the risk of catastrophic failure, which could result in long-term disruption of water supplies as well as significant losses from flood damage to agricultural land and critical infrastructure in the Delta (including aqueducts, railroads, highways, gas and petroleum pipelines and power facilities). In addition, the likely consequences of climate change on the Delta are still being evaluated, but it is clear that climate change is a new and significant uncertainty factor in all Delta resource management activities.

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1 The contracts between DWR and the 29 SWP contractors define the terms and conditions governing water delivery and cost repayment for the SWP. Table A refers to an exhibit to each water supply contract. It governs the contractual method for allocating available supply and for allocating some of the costs among the contractors. The total of all Table A amounts for deliveries from the Delta is 4.133 MAF (million-acre-feet) per year. Each contract's Table A amount is the volume in acre-feet that is used to determine the portion of available supply to be delivered to that contractor each year (DWR, 2008).

1.4.6 Declining Drinking Water Quality

Delta water quality for drinking water supplies has generally declined because of saltwater intrusion resulting from water resources management actions; polluted runoff from urban, agricultural, and other land development; and changes in the physical environment. Seasonal variations as well as longer-term degradation of Delta water quality result in elevated salinity, total dissolved solids, bromide, total organic carbon, algae concentrations, and high levels of hardness and turbidity, which can affect treatment cost and effectiveness, taste and odor, and health considerations.

1.5 Improving the Delta Ecosystem, Water Supply Reliability and Water Quality

Over the last 15 years, the federal and state governments together with numerous stakeholders have embarked on several large-scale programs to protect, improve, and better balance competing uses in the Delta. The most comprehensive of these efforts are CALFED and the Delta Vision process. Common to these two programs is recognition that both a healthy Delta ecosystem and a reliable water supply are necessary for a sustainable future in the State of California. Also common to both of these programs is recognition that key to any sustainable solution to the Delta crisis is increased storage and flexibility to manage the water supply system to optimally deliver water to meet environmental needs as well as urban and agricultural needs.

1.5.1 Improving Environmental Water Management and Water Supply Reliability

The Los Vaqueros Reservoir Expansion Project would provide storage and conveyance capabilities to help achieve these objectives. The proposed project facilities would be operated in a coordinated fashion with the SWP and CVP facilities to improve fishery protection, habitat management and supply reliability. Depending on the alternative selected, the project could contribute to the dual and interrelated goals of a healthy Delta ecosystem and a reliable water supply in multiple ways, as follows:

- **The Los Vaqueros Reservoir Expansion Project would develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs:**
  - Fish Protection through Improved Fish Screening. All water diverted through reservoir expansion project facilities would be through intakes equipped with state-of-the-art positive barrier fish screens designed and operated to regulatory agency specifications. The SWP and CVP pumps do not have positive barrier fish screens but instead use salvage facilities that can result in significant fish mortality. Diverting water through Expanded Los Vaqueros Reservoir system intakes would result in less impact to fish than the same amount of water diverted from either the SWP or CVP export facilities. This is because the scale of the diversions is much smaller, new technology fish screens are highly effective at preventing entrainment, and the intakes are in areas where fish screen sweeping flow criteria can be met.

- Fish Protection through Water Management Flexibility. The Los Vaqueros Reservoir Expansion Project would increase water management flexibility by adding storage and developing multiple intakes. Increased storage allows diversions from the Delta into the expanded Los Vaqueros Reservoir system to be reduced or eliminated during the most sensitive fish period without disrupting supplies. Current requirements for Los Vaqueros Reservoir operations include a no-diversion period during the most critical spring fish period. During this period, CCWD ceases pumping from the Delta and relies on the water stored in the reservoir for deliveries to its customers. All the alternatives evaluated in this document include a similar no-diversion period during which water is delivered from the expanded Los Vaqueros Reservoir in lieu of pumping from the Delta, protecting fish when they are most vulnerable.

  Multiple intakes, coupled with additional storage capacity, would improve water management flexibility to respond to changing fishery conditions in the Delta. With these facilities, the timing and/or location of water diversions would be coordinated with the CVP and SWP and adjusted to avoid sensitive periods and locations for fish.

- Dedicated Storage for Environmental Water. Storage capacity dedicated to water supply for environmental purposes (environmental water) provides an opportunity to secure more water for environmental purposes than is now possible, potentially at lower cost, and ensures that this water can be reserved until called upon to support environmental water needs. Water reserved in storage for environmental purposes can be used in many ways such as altering timing of pumping to avoid sensitive periods for aquatic species while maintaining water deliveries, increasing river flows when needed for spawning or migrating fish or delivering supply to managed wildlife refuges[2] that support extensive wetlands and waterfowl populations. The reservoir expansion project could establish dedicated storage for environmental water.

- **The Los Vaqueros Reservoir Expansion Project would increase water supply reliability for the Bay Area:**

  - Increased Reliability through Water Management Flexibility. The same system flexibility to change the location and/or timing of diversions in coordination with the SWP and CVP that would reduce impacts to fish (noted above) would also increase supply reliability. Having multiple points of diversion in the Delta means that, at times, while one diversion location needs to be closed to protect fish, another can remain open, allowing some level of supply delivery to be maintained. With additional storage, demands can be met with releases from the reservoir even when Delta diversions are curtailed to avoid sensitive fish periods and protect environmental resources.

  - Increased Reliability through Expanded Storage. An expanded Los Vaqueros Reservoir system could be used to partially restore delivery reductions for ACWD, SCVWD and Zone 7 due to regulatory restrictions at the SWP and

[2] The CVP Improvement Act (1992) requires the Secretary of Interior, through Reclamation and U.S. Fish and Wildlife Service, to operate the CVP for project purposes including fish and wildlife protection, restoration, enhancement and mitigation as well as power generation, irrigation and domestic water use. One of the programs required to further these purposes is the refuge water supply program. Under this program, specific amounts of water are to be provided to certain Central Valley wildlife refuges. This water cannot always be provided due to a variety of constraints including cost and availability of water, pumping capacity, storage, and conveyance infrastructure.

CVP Delta pumps to protect fisheries. The expanded storage capacity would also allow additional water to be reserved from one year to another to respond to drought periods and emergencies. An expanded reservoir could provide as much as 235 TAF of storage capacity on average that could be available to Bay Area communities during emergencies.

1.5.2 Improving Drinking Water Quality

A secondary objective of the reservoir expansion project is to improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental water management and water supply reliability objectives.

The existing quality of water supplies from the Delta has generally declined because of saltwater intrusion resulting from water resources management actions; polluted runoff from urban, agricultural, and other land development; and changes in the physical environment. Seasonal variations as well as longer-term degradation of Delta water quality result in elevated salinity, total dissolved solids, bromide, total organic carbon, and algae concentrations and high levels of hardness and turbidity. As a result, some drinking water supplies originating in the Delta are subject to water treatment challenges for utilities; taste and odor problems for consumers; and increased health risks for certain populations. At the same time, water quality regulations are becoming more restrictive, requiring agencies supplied from the Delta to continue to strive to improve the quality of water they divert so, in turn, they can improve the quality of water delivered to their customers.

The reservoir expansion project could provide incidental improvements in the quality of Delta water provided to Bay Area water agencies that receive deliveries from the South Bay Aqueduct. Salinity levels would be reduced in South Bay Aqueduct deliveries in dry periods as a result of storing water in Los Vaqueros Reservoir at times when water quality is high, and then providing that higher quality water in lieu of direct diversions from the Delta when water quality is poor. The reservoir expansion project could also improve other aspects of water quality for the agencies on the South Bay Aqueduct, as the water delivered from Los Vaqueros Reservoir would no longer pass through Clifton Court Forebay, where algae growth in the warm, shallow, slow-moving water results in an increase in organic carbon content and taste and odor issues.

The expanded reservoir would also improve water quality for CCWD by providing a larger supply of high quality water stored in the reservoir to blend with Delta supplies in dry years.

CHAPTER 2

Project Background

This chapter provides an overview of the existing Los Vaqueros Reservoir facilities and operations, a history of the expansion project, a description of current Delta water supply facilities and operations, and a summary of ongoing planning and regulatory processes related to the Delta. This information provides context for understanding how expansion of the Los Vaqueros Reservoir could achieve the objectives outlined in Chapter 1, Purpose and Need.

2.1 Existing Los Vaqueros Reservoir

The Los Vaqueros Reservoir is a 100 thousand-acre-foot (TAF) offstream storage reservoir in southeastern Contra Costa County owned and operated by the Contra Costa Water District (CCWD)[1]. The reservoir is operated to improve water quality and provide emergency storage for CCWD's 550,000 customers in central and eastern Contra Costa County. CCWD completed the reservoir and associated facilities (including a new intake on Old River near State Route 4 (SR 4)) in 1997. The reservoir facilities are operated as an integrated system with the Contra Costa Canal and Rock Slough Intake built as part of the federal Central Valley Project (CVP) in the 1940s. These facilities are described in more detail in the following sections. CCWD also owns the Los Vaqueros Watershed (watershed) which covers about 20,000 acres. The watershed lands are managed for water quality, conservation, and recovery of special-status species and their habitats, and recreation. The reservoir also provides flood control benefits on Kellogg Creek.[2] The CCWD service area, watershed lands, and major untreated water facilities are shown on **Figure 2-1**.

More recently, CCWD has constructed or is constructing two facilities that will be operated integrally with the reservoir: the CCWD-East Bay Municipal Utility District (EBMUD) Intertie, completed in 2007, and a new intake on Victoria Canal known as the Alternative Intake Project (AIP), currently under construction. These new facilities are also described in the following sections.

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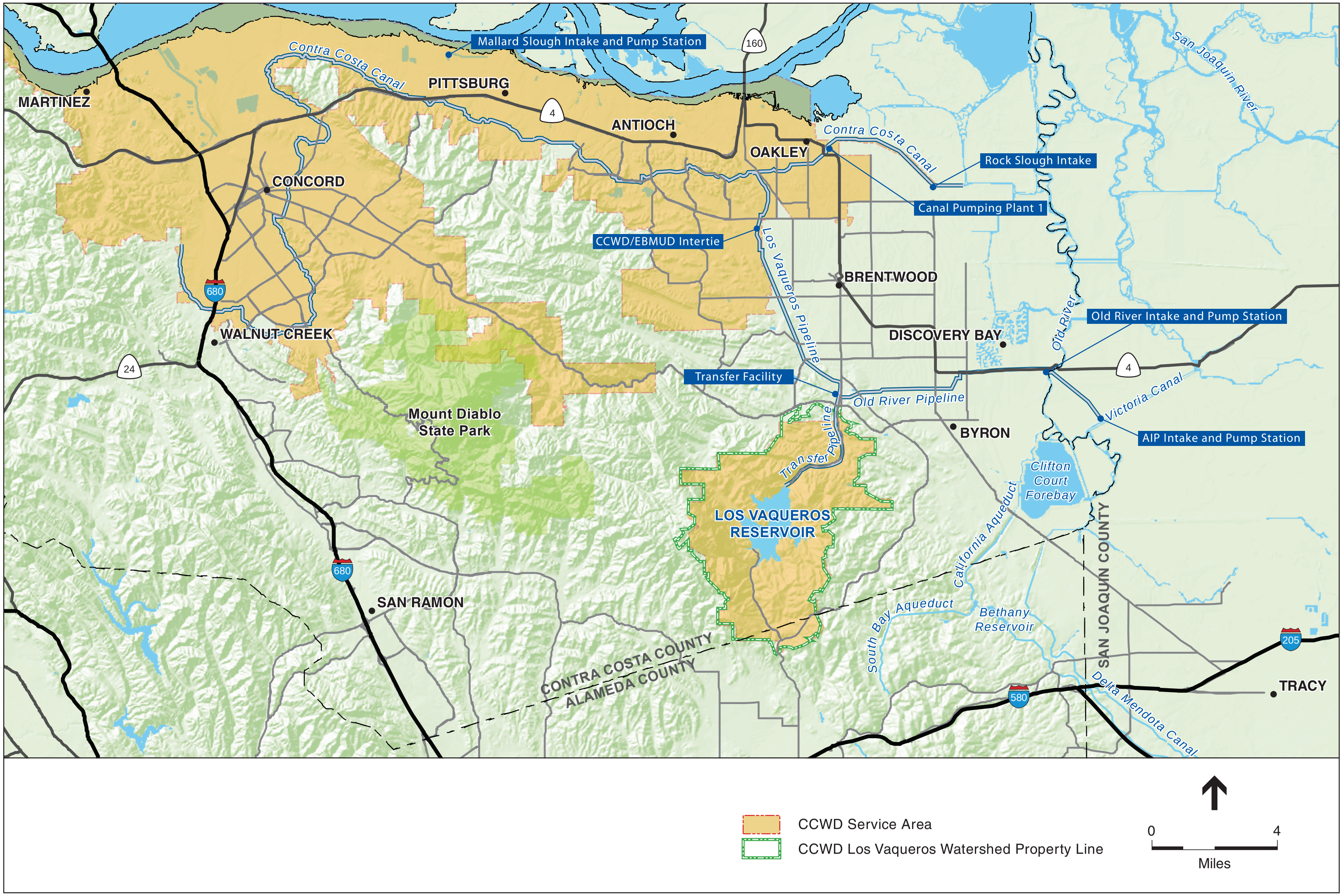
1 CCWD is a public agency formed in 1936 to provide water for irrigation and industry. CCWD is now one of the largest urban water districts in California, serving treated and untreated water to about 550,000 customers in Antioch, Bay Point, Clayton, Clyde, Concord, Martinez, Oakley, Pacheco, Pittsburg, and portions of Brentwood, Pleasant Hill, and Walnut Creek in Contra Costa County. CCWD's mission is to "strategically provide a reliable supply of high quality water at the lowest cost possible, in an environmentally responsible manner." CCWD receives most of its water through the federal CVP.

2 Although this benefit is infrequently realized, in 1998, a wet year, flows of 400 cubic feet per second (cfs) were produced in Kellogg Creek downstream of the reservoir; the reservoir held back an additional 400 cfs, thereby protecting the community of Byron and other downstream areas.



SOURCE: USGS, 1993 (base map); and ESA, 2005

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 2-1
CCWD Service Area and Major Facilities

2.1.1 Los Vaqueros Reservoir and Associated Facilities

Los Vaqueros Dam and Reservoir

The Los Vaqueros Dam is a 190-foot-high zoned earthfill embankment dam with a crest elevation of 487 feet above mean sea level. The volume of the dam embankment is about 2.85 million cubic yards. The reservoir occupies about 1,462 acres when full (about 100 TAF). A spillway is located on the left abutment and the inlet/outlet structure is located on the right abutment. The dam was designed to withstand the maximum credible earthquake of moment magnitude (M) 6.5 on the Greenville Fault, about 4 miles west of the dam. The dam is in full compliance with all requirements of the California Department of Water Resources, Division of Safety of Dams.

When the dam was originally designed, no measures were incorporated to facilitate raising the dam in the future, but recent engineering analysis has concluded that a limited raise is feasible. The amount of raise is limited by a combination of topographic constraints and the design of the dam. Raising the dam by the maximum amount considered feasible would allow the reservoir water surface to be raised 88 feet, which would create an additional 175 TAF of reservoir storage.

Old River Intake and Pump Station

The Old River Intake and Pump Station diverts water from Old River through a fish screen with an area of 1,250 square feet and delivers it to the Old River Pipeline. The pump station has five 2,100-horsepower pumps that deliver up to 250 cubic feet per second (cfs). The Old River Intake and Pump Station has a design capacity of up to 320 cfs. The additional 70 cfs in intake capacity could be realized by changing to higher horsepower pumps and adding fish screen panels. The facility is on a 16.8-acre site near SR 4 and Discovery Bay.

The Old River fish screen was designed to meet approach velocity criteria established by National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), and California Department of Fish and Game (CDFG). Specifically, the screen must have an average approach velocity of 0.2 foot per second (fps). The screen design was approved by NMFS as required in the 1993 Biological Opinion addressing the effects of the Los Vaqueros Project on winter-run chinook salmon. The screen is a vertical plate type, with stainless steel wedge wire screens with 3/32-inch vertical openings. It is oriented parallel to the ambient flow in Old River, allowing fish to move past the intake. It is equipped with a traveling rake automated cleaning system. A log boom and a debris deflector are also in place.

The Old River Intake and Pump Station fish screen facilities are shown in **Figure 2-2**. The Old River fish screen has successfully protected against entrainment since it began operation in 1997. In 11 years of monitoring, no salmon, one delta smelt, and one longfin smelt larva have been found to have passed through the screen.

SOURCE: GlobeXplorer, 2007; and ESA, 2007

Figure 2-2
Existing Old River Intake and Pump Station

Old River Pipeline, Transfer Facility, Transfer Pipeline and Los Vaqueros Pipeline

The Old River Pipeline connects the Old River Intake and Pump Station to the Transfer Facility. The pipeline is about 34,700 feet long and 78 inches in diameter and can convey up to 320 cfs. The pipeline is in a CCWD-owned 85-foot-wide permanent right-of-way. From the Transfer Facility, water can be pumped up to the reservoir through the Transfer Pipeline, or allowed to flow down to the Contra Costa Canal through the Los Vaqueros Pipeline.

The Transfer Facility includes the following facilities:

- **Transfer Pump Station.** An 8,400-horsepower plant that delivers up to 200 cfs to the reservoir
- **Transfer Reservoir.** A 4-million-gallon reservoir that provides water storage for flow control operations
- **Flow Control Station #1.** Regulates flow from the Transfer Pipeline into the Los Vaqueros Pipeline

The Transfer Pipeline consists of about 19,600 feet of 72-inch-diameter pipe and connects the Transfer Facility to the reservoir. The Transfer Pipeline can convey up to 200 cfs from the Transfer Facility to the reservoir and up to 400 cfs from the reservoir to the Transfer Facility. The pipeline is in an 85-foot right-of-way.

The Los Vaqueros Pipeline connects the Transfer Facility to the Contra Costa Canal at the Neroly blending basin in Oakley. The pipeline consists of two continuous segments: the first is about 18,000 feet long with a 96-inch-diameter pipe and the second is 29,000 feet long with a 90-inch-diameter pipe. The pipeline is in an 85-foot right-of-way and has a capacity of 400 cfs. The Neroly blending basin includes a flow control station that dissipates excess water pressure from the pipeline in order to control the amount of water entering the canal. As part of CCWD's capital improvement program, an energy recovery system is being designed to capture the energy released in this process and transmit it to other CCWD facilities to offset existing electrical loads.

Contra Costa Canal and Rock Slough Intake

The Contra Costa Canal was completed by the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) in 1948. The canal is owned by Reclamation and operated by CCWD. The canal is the primary conveyance facility for CCWD's untreated water supply, carrying water from both the Rock Slough Intake and the Old River Intake (via the Los Vaqueros Pipeline) for deliveries to treatment plants, large industries, and irrigation customers throughout CCWD's service area. The canal is 48 miles long with capacities ranging from 350 cfs at the Rock Slough Intake to 22 cfs at its western terminus at the Martinez Reservoir. The first 4 miles of the canal are earth lined, while the remaining 44 miles are concrete lined. The earth-lined portion of the canal is subject to water quality degradation due to seepage into the canal from saline groundwater in the area. CCWD is undertaking a project to encase this portion of the canal to stop the degradation. A series of four pumping plants lift the water from Rock Slough to 126 feet above sea level, after which the water flows by gravity to the terminus.

The Rock Slough Intake has a capacity of 350 cfs and is currently unscreened. Because water quality at Old River is generally better than at Rock Slough, and because the Old River Intake is screened, Rock Slough is used less frequently than it was before the Los Vaqueros Reservoir was completed. When AIP is operational, use of Rock Slough will be reduced even further. However, the Old River Intake and AIP do not have sufficient capacity to meet all CCWD's demands now and in the future, so Rock Slough continues to be an important component of CCWD's system. Reclamation, in collaboration with CCWD, is responsible for constructing a fish screen at Rock Slough under the CVP Improvement Act and the 1993 USFWS Biological Opinion for the Los Vaqueros Project. Reclamation has received an extension on fish screen construction until December 2008, and is preparing a request for further extension until 2018 because the requirements for screen design will change when CCWD completes the ongoing project to encase the earth-lined portion of the canal.

Intertie with EBMUD

The EBMUD-CCWD Intertie connects the Los Vaqueros Pipeline with the Mokelumne Aqueduct in Brentwood, enabling CCWD to wheel a portion of its CVP contract water supply through Freeport Regional Water Authority (FRWA) and EBMUD facilities to the reservoir. Under an agreement between CCWD, EBMUD, and FRWA, CCWD can wheel up to 3,200 acre-feet per year through the intertie. The intertie also functions as an emergency connection between EBMUD and CCWD, enabling the districts to share water resources in an emergency or during planned outages. The capacity of the intertie is 155 cfs.

The Freeport Regional Water Project (FRWP) is currently under construction. Environmental review for the FRWP was completed in January 2005. Facilities include a water intake and pumping plant in the Sacramento River, a pipeline connecting to the Mokelumne Aqueduct, and a pumping plant at the southern end of the Folsom South Canal. Construction is expected to be completed in December 2009. When completed, EBMUD will take its dry-year CVP contract water through the FRWP.

Alternative Intake Project

The AIP adds a new 250-cfs intake on Victoria Canal that is connected to the Old River Pipeline via a 2.5-mile buried pipeline across Victoria Island and through a tunnel beneath Old River. The new intake will be equipped with a state-of-the-art positive barrier fish screen. The AIP fish screen has been designed to meet all standards set by NMFS, USFWS, and CDFG. The screen would have a maximum flow velocity of 0.2 fps at any flow level in Victoria Canal, 2/32-inch screen openings, and a mechanical cleaning system.

The AIP will increase CCWD's access to high quality water year-round, especially in the fall and during drought periods. It will also help to ensure that the investment CCWD customers have made in water quality improvements and infrastructure, including the reservoir, will be protected as water quality in the Delta deteriorates. The AIP does not increase the total amount of water diverted from the Delta, but provides additional flexibility to optimize diversions to maximize water quality and fish protection. Environmental review for the AIP was completed in 2006. The AIP is expected to be operational in 2010.

Los Vaqueros Reservoir Facilities Power Supply

Power is transmitted to the Old River Intake and Pump Station over lines owned and operated by Western Area Power Administration (Western). A 230-kV line being operated at 69 kV runs from the Tracy substation near the CVP Jones Pumping Plant to the Old River Intake and Pump Station, and is being extended to the AIP. The delivered power is from one of two sources: CVP power and Modesto Irrigation District (MID) power. CVP power used by CCWD is exclusively hydroelectric power. MID power is generated from a variety of sources including renewables and large hydropower (48 percent), coal (28 percent), and natural gas (24 percent) (Smith, 2007). Power needs at the Transfer Facility and within the watershed are met by Pacific Gas & Electric (PG&E) through their Brentwood substation. PG&E's portfolio includes natural gas (40 percent), renewables and large hydropower (34 percent), and nuclear (24 percent) (PG&E, 2008).

Los Vaqueros Watershed Recreation Facilities

Recreational facilities that provide both water-oriented and upland recreational opportunities were constructed and have been operated since 2001. These include 55 miles of trails, a marina, fishing piers, an interpretive center, and picnic areas. Recreation facilities and programs are managed in a manner consistent with the Resource Management Plan adopted by the CCWD Board of Directors in 1999 and with biological opinions issued by USFWS and CDFG covering San Joaquin kit fox, bald eagle, California red-legged frog, and Alameda whipsnake, among other threatened and endangered species in the watershed.

2.1.2 Los Vaqueros Reservoir Operations

CCWD operates the reservoir together with its intakes to provide high quality, low-salinity water to its customers. In winter and spring, when the Delta is relatively fresh (generally January through July), customer demand is supplied by direct diversion from the Delta. In the late summer and fall months, CCWD releases water from the Los Vaqueros Reservoir to blend with higher-salinity direct diversions from the Delta to meet CCWD water quality goals. The reservoir is re-filled during winter and spring, when chloride concentrations at Old River are low, generally less than 50 milligrams per liter (mg/L).

The reservoir is operated in a manner consistent with the biological opinions for the reservoir, which require numerous fish protection measures, including an annual 75-day "no-fill" period and a concurrent 30-day "no-diversion" period. The default dates for the no-fill and no-diversion periods are March 15 through May 31 and April 1 through April 30, respectively; USFWS, NMFS, and CDFG can change these dates to best protect covered species. Customer demand during the no-diversion period is met through releases from the reservoir. CCWD also preferentially uses the screened Old River Intake over unscreened Rock Slough from January through August to further protect fish.

CCWD diverts unregulated flows and regulated flows from CVP storage facilities releases as a contractor of Reclamation's CVP. Under Water Service Contract No. I75r-3401A-LTR1 (renewed May 10, 2005) with Reclamation, CCWD can divert and re-divert up to 195 TAF per year of water from its Rock Slough and Old River intakes (and AIP under a letter approval from Reclamation expected in 2009) for direct use or to storage in Los Vaqueros Reservoir. CCWD also diverts from Old River to storage in the reservoir under its own Los Vaqueros water right permit (Permit No. 20749)[3].

Los Vaqueros Project Water Right (Permit No. 20749)

The terms and conditions governing CCWD's diversion to storage in Los Vaqueros Reservoir under Permit No. 20749 are given in California State Water Resources Control Board (SWRCB) Decision 1629 (D1629). D1629 provides that CCWD may divert water under Permit No. 20749 from Old River to Los Vaqueros Reservoir from November through June during excess conditions in the Delta, as defined in the State Water Project (SWP)/CVP Coordinated Operations Agreement, when those diversions will not adversely impact the operations of the SWP and CVP; CCWD may also divert water under its CVP water supply contract to storage in Los Vaqueros Reservoir throughout the year, subject to the operational restrictions discussed below. D1629 specifies the maximum diversion rates at 250 cfs and annual diversion to storage (95,800 acre-feet annually at a rate of 200 cfs) by CCWD to Los Vaqueros Reservoir.

CCWD's operations are governed in part by three biological documents: (1) 1993 NMFS Biological Opinion for winter-run chinook salmon, (2) 1993 USFWS Biological Opinion for Delta Smelt, and (3) 1994 Memorandum of Understanding between CDFG and CCWD regarding the Los Vaqueros Project. The biological documents specify the following:

- **No-Fill Period.** CCWD will avoid filling Los Vaqueros Reservoir for 75 days each spring. The default no-fill period is March 15 through May 31. This condition is also included in D1629.
- **No Diversion Period.** CCWD will avoid Delta diversions for 30 days each spring, concurrent with part of the no-fill period. The default no-diversion period is the month of April. This condition is also included in D1629.
- **Emergency Storage.** The no-fill and no-diversion restrictions are in effect only when Los Vaqueros Reservoir is above emergency storage levels. Emergency storage is defined as 70,000 acre-feet in below-normal, above-normal, and wet years, and 44,000 AF in dry and critical years. This condition is also included in D1629.
- **X2 Restrictions.** Los Vaqueros Reservoir may be filled when X2 (the location of the 2 parts-per-thousand salinity line) is west of Chipps Island in February through May, and Collinsville in January, June through August, and December. X2 restrictions on filling in December

[3] At the same time, the SWRCB also issued Permit No. 20750 to CCWD for diverting and storing the water from Kellogg Creek in Los Vaqueros Reservoir.

only exist when adult delta smelt are present at the Old River Intake. In 2005, CDFG and USFWS granted a temporary waiver on the July and August X2 restrictions, allowing 5 years to evaluate bringing CCWD's operating restrictions in line with D1641, during which X2 standards apply from February to June only.

Biological opinions issued for the AIP by both USFWS and NMFS integrate operations of the AIP into operations of the facilities previously described to minimize take of sensitive fish species. Under the USFWS biological opinion, the combined diversion rate of Old River Intake and AIP is 320 cfs.

Mallard Slough Water Right

CCWD has a license and a permit for diversions at Mallard Slough for up to 26,780 AF per year. However, Mallard Slough diversions are unreliable during most of the year because of high salinity in the San Joaquin River at the point of diversion. Over the last 10 years, diversions by CCWD from Mallard Slough have averaged less than 3,000 AF per year. Diversions from Mallard Slough substitute for other diversions, principally CVP supplies from Rock Slough.

Water use within CCWD's service area is currently between 125 and 140 TAF per year, depending on weather conditions. These demands are met with a combination of reservoir releases and direct diversions of CVP contract water, as well as diversions under other water rights held by CCWD customers for their own use (e.g., the City of Antioch has its own pre-1914 water rights), groundwater, conservation, and recycled water. **Table 2-1** shows water use by source with the CCWD service area.

TABLE 2-1
WATER USE WITHIN THE CCWD SERVICE AREA BY WATER SOURCE (ACRE-FEET)

	CVP direct diversion	Releases from Los Vaqueros Reservoir[a]	Other Water Rights[b]	Ground-water[c]	Recycled water	Water Transfer Purchases	Total water use	Quantifiable Direct and Other Conservation[d]
2006	90,800	10,850	9,750	1,450	7,600	2,300	122,750	3,300; 30,000
2007	73,100	34,900	4,800	2,170	8,700	7,000	130,670	3,400; 30,000

[a] Los Vaqueros water rights water
[b] Other water rights include CCWD's Mallard Slough water rights and diversions by the City of Antioch.
[c] Groundwater usage of Diablo Water District, Golden State Water Company, and City of Pittsburg.
[d] The first figure is estimated savings from CCWD conservation programs that are directly quantifiable. Savings related to plumbing codes, regulation, changing industry standards, or actions taken by CCWD and its customers for which the savings are not directly quantifiable are estimated to be 30,000 acre-feet annually.

Between 44 TAF and 70 TAF of reservoir capacity is used for emergency storage (depending on hydrological conditions) that would provide from 3 to 6 months of supply for CCWD at current demand levels during times when water from the Delta is unavailable due to natural disaster, toxic spill, levee failure, or other significant event.

CCWD Water Quality Goals

CCWD's long-term water quality goal is to deliver water with chloride concentrations of 65 mg/L or less to its customers. To achieve this delivered quality, reservoir filling usually targets water with less than 50 mg/L of chloride. On average, chloride concentrations in the reservoir are about 35 mg/L. Reservoir water released from storage is blended with water from Old River and Rock Slough intakes that can have chloride concentrations as high as 210 mg/L and 275 mg/L, respectively, depending on season, annual hydrology, discharges to and exports from the Delta; by blending, CCWD is able to deliver high quality water to its customers throughout the year.

Other source water quality constituents of concern for CCWD due to its reliance on Delta water include bromide, total organic carbon (TOC), and pathogens. Delta water must be disinfected to meet federal drinking water regulations, which impose stringent limits on disinfection by-products in treated water. Bromide and TOC are precursors of regulated disinfection by-products. Currently, CCWD's primary means of ensuring that disinfection by-product standards are met in the treated water is to ensure that bromide and TOC levels in the source water from the Delta are maintained below certain levels (reducing the need for disinfectant, and the resulting by-products). Bromide levels in the Delta correspond closely to chloride levels; thus, by managing for chloride, CCWD effectively manages for bromide. CCWD's source water quality goal for bromide is 50 micrograms per liter. TOC levels in the Delta vary seasonally and tend to increase during periods when chloride and bromide are decreasing. CCWD's source water quality goal for TOC is less than 3.0 mg/L. When necessary, CCWD reduces high TOC levels by the addition of coagulant at its treatment plants.

CCWD monitors for all of these constituents, as well as turbidity, algae, and taste and odor-causing compounds and adjusts operations daily to meet its water quality goals.

2.1.3 CCWD Long-Range Water Supply Planning

CCWD conducts long-range water supply planning in coordination with its wholesale customers and the cities to which it provides retail water service. This plan, the Future Water Supply Study (FWSS), identifies the specific sources and programs CCWD plans to implement to accomplish its mission of providing a reliable supply of high quality water at the lowest cost possible, in an environmentally responsible manner (CCWD, 1998). In addition to the surface water supplies obtained through its CVP contract and its Los Vaqueros and Mallard Slough Water Rights, CCWD has identified conservation, recycled water, and water transfers as other important sources of supply in the FWSS.

In 1999, CCWD certified a program-level Environmental Impact Report (EIR) addressing the impacts of implementing the FWSS (Future Water Supply Implementation (FWSI) EIR) (CCWD, 1999). The FWSI EIR assessed the broad environmental effects associated with conserving water and providing additional water supplies to meet the demands of growth and diverting additional water from the Delta. The effects of individual implementation projects, such as specific water transfers, were not covered in this programmatic document, although the effects of programmatically providing sufficient supplies for the growing population were covered. A key element of the FWSS was that implementation would be accomplished incrementally so that growth was not encouraged beyond that which was already planned and permitted by local land use agencies with land use authority.

CCWD also consulted with USFWS and received a biological opinion for the FWSI in conjunction with an infrastructure project being undertaken at the same time (the Multi-Purpose Pipeline) (USFWS, 2000). A conservation measure in the Biological Opinion required CCWD to initiate and help fund a Habitat Conservation Plan for the East Contra Costa County area to offset the effects of urban development on listed and proposed plant and wildlife species in east Contra Costa County. CCWD was also required to ensure that the proponents for annexation to CCWD had all environmental approvals in place, including approval from USFWS, before providing CVP water.

2.2 Development of the Los Vaqueros Reservoir Expansion Project

The Los Vaqueros Reservoir Expansion Project (reservoir expansion project) is a multi-agency effort that would provide local, regional, and state-wide environmental, water supply, and water quality benefits. The project grew out of the comprehensive federal/state cooperative program known as CALFED Bay-Delta Program (CALFED) that seeks to improve the quality and reliability of California's water supplies while restoring the Bay-Delta. In August 2000, CALFED published the CALFED Record of Decision, which laid out a plan for restoring the Bay-Delta ecosystem and improving water supply reliability and water quality. Expansion of Los Vaqueros Reservoir was included as one of five water storage programs identified for further investigation. Since that time, CCWD, Reclamation, and the California Department of Water Resources (DWR) have developed and refined the Los Vaqueros Reservoir Expansion Project through detailed studies and extensive public outreach.

2.2.1 Project Leadership

CCWD, as owner-operator of the reservoir, is the lead agency under the California Environmental Quality Act (CEQA) and has been managing the reservoir expansion project studies with funding from both Reclamation and DWR. Reclamation is the lead agency under the National Environmental Policy Act (NEPA). Reclamation's involvement is authorized by Congress through Public Laws 108-7 and 108-361, which authorized Reclamation to undertake a feasibility study of expanding the reservoir and to pursue its development, along with other ongoing environmental and storage projects, in a balanced manner. DWR's interest in the reservoir expansion project started with the state's commitment to the CALFED Storage Program and continues based on recognized needs to restore reliability to SWP contractors in the Bay Area while meeting CALFED goals of ecosystem restoration in the Delta.

Many federal, state, and local agencies participate in the reservoir expansion project through the Los Vaqueros Memorandum of Understanding (LV MOU) regarding preliminary studies (feasibility studies, environmental review, and preliminary design) for the reservoir expansion project. The LV MOU agencies are periodically updated on project development through an

Agency Coordination Work Group, and are given opportunities to review and comment on early drafts of studies. This early involvement helps ensure that these studies provide the LV MOU agencies with information relevant to future decisions they may make related to the reservoir expansion project such as granting a permit or becoming a beneficiary (DWR et al., 2001).

Western is a cooperating agency under NEPA and will rely on this document in making decisions regarding providing power to new and expanded facilities proposed as part of the reservoir expansion project.

2.2.2 Project Approval Process

Approving one of the Los Vaqueros Reservoir Expansion Project alternatives evaluated in this Environmental Impact Statement (EIS)/EIR will require completion of the CEQA/NEPA process by the lead agencies, a determination by the CCWD Board of Directors that the proposed project is consistent with their adopted Principles for Expansion (set forth below), and decisions by potential beneficiaries as to the nature and extent of their participation. The latter decisions depend in part on the outcomes of federal and state feasibility studies and regional evaluations of benefits and costs, being conducted by the potential participants in parallel with the environmental review process.

CCWD Board Principles for Expansion

In June 2003, the CCWD Board of Directors adopted a set of principles by which CCWD would consider participating in a proposal for a Los Vaqueros Reservoir Expansion Project[4]. The Board will consider participating in an expansion project if it meets the following conditions:

1. Improves drinking water quality for CCWD customers beyond that available from the existing Los Vaqueros Project;
2. Improves the reliability of water supplies for CCWD customers during droughts;
3. Enhances Delta habitat and protects endangered Delta fisheries and aquatic resources by installing state-of-the-art fish screens on all new intakes and creating an environmental asset through improved location and timing of Delta diversions and storage of water for environmental purposes;
4. Increases the protected land and managed habitat for terrestrial species in the Los Vaqueros Watershed and the surrounding region;
5. Improves and increases fishing, boating, hiking, and educational opportunities in the Los Vaqueros Watershed, consistent with the protection of water quality and the preservation of the watershed and the watershed's unique features;
6. CCWD continues as owner and manager of the Los Vaqueros Watershed;

[4] These CCWD Board Principles expand upon an earlier set of principles from April 2000 that were directed at formulating the concept of a Los Vaqueros Reservoir expansion. As a result of preliminary engineering and environmental studies, CCWD determined that an expansion project could be defined that met its principles. The 2003 CCWD Board Principles provide guidance for continued refinement of such an expansion project and provide conditions for CCWD's participation.

7. CCWD maintains control over recreation in the Los Vaqueros Watershed;
8. CCWD continues as operator of the Los Vaqueros Reservoir system;
9. CCWD will be reimbursed for the value of the existing Los Vaqueros Project assets shared, replaced, rendered unusable, or lost with the expansion project and said reimbursement will be used to purchase additional drought supply and water quality benefits or reduce debt on the existing Los Vaqueros Project;
10. Water rates for CCWD customers will not increase as a result of the expansion project.

In March 2004, the CCWD Board of Directors placed an advisory measure on the ballot asking voters in its service area whether CCWD should expand the Los Vaqueros Reservoir under these principles. The measure won approval of 62 percent of voters.

2.2.3 Los Vaqueros Reservoir Expansion Studies to Date

The planning phase of the Los Vaqueros Reservoir Expansion Project began in January 2001. Most of this early work focused on determining whether an expanded reservoir could meet state and federal program goals (i.e., CALFED goals) and the CCWD Board Principles. The Project Concept Report prepared by CCWD in 2002 was the first report to present preliminary information on initial alternatives and potential benefits of the expansion project (CCWD, 2002). As alternatives were better defined, a federal feasibility study was started. Some of the preliminary analyses for the federal feasibility study have been published as separate studies, such as the Initial Economic Evaluation for Plan Formulation Report (IEEPF) summarized below (Reclamation, 2006). The EIS/EIR process began with publishing the Notice of Intent (NOI) in the Federal Register in December 2005 and issuing the Notice of Preparation (NOP) in January 2006. The studies or publications summarized here can be accessed on the project web site at www.lvstudies.com.

Feasibility-Related Studies

April 2004 Final Draft Planning Report. The Final Draft Planning Report prepared by CCWD presents the information developed during this planning phase of the Los Vaqueros Reservoir Expansion Studies and incorporates comments received to date (CCWD, 2004).

September 2005 Initial Alternatives Information Report (IAIR). The primary purpose of the IAIR is to document the first phase of the Federal Feasibility Study for the Los Vaqueros Expansion Investigation (Reclamation, 2005). Specifically, this report describes formulation of initial alternative plans to address the identified problems, opportunities, and planning objectives that primarily involve enlarging the reservoir.

July 2006 IEEPF. As part of the Federal Feasibility Study, Reclamation published the IEEPF which evaluates whether a project alternative could meet federal interests and therefore warrant continued federal funding. The report provides an economic and plan formulation update to support a federal decision. Based on this initial evaluation, the IEEPF concluded that expansion of Los Vaqueros Reservoir is cost effective and can be implemented while meeting the CCWD Board Principles.

EIS/EIR Process

December 2005 NOI. The NOI published by Reclamation in the Federal Register notified agencies of the preparation of the EIS for the project.

January 2006 NOP. The NOP published by CCWD described the proposed project alternatives under consideration for review in the EIS/EIR and identified the main environmental issues to be addressed during the environmental review. (Note that at the time of the NOP, the maximum size reservoir under consideration was 500 TAF. Based on preliminary feasibility and environmental studies, the maximum size reservoir now under consideration is 275 TAF. Other project facilities such as pumps and pipelines are commensurately smaller as well.)

Four public scoping meetings were held in January 2006 to solicit input on the EIS/EIR. A Scoping Report that documents the scoping meetings, the comments received and responses to the comments is included as Appendix A to this EIS/EIR.

2.3 Delta Water Supply Facilities and Operations

Many small water diversion facilities in the Delta serve in-Delta agricultural needs as well as some urban needs like CCWD's, but the most significant facilities due to their size and influence on Delta conditions, as well as the number of water users they serve, are the federal and state water supply facilities that export water for the CVP and the SWP, respectively. The following sections describe these two projects and give an overview of the coordinated operations of the projects. In-Delta water use is also summarized.

2.3.1 Central Valley Project

The federal CVP is the largest water storage and delivery system in California, with its facilities and service area extending over 29 counties. The CVP's features include 18 federal reservoirs, plus 4 additional reservoirs jointly owned with the SWP (primarily, San Luis Reservoir). **Figure 2-3** shows the locations of major CVP features.

The reservoirs in this system provide a total storage capacity of slightly over 12 million acre-feet (MAF), nearly 30 percent of the total surface storage in California, and deliver about 7.3 MAF annually to agricultural, urban, and wildlife uses. The keystone of the CVP is the 4.6-MAF Lake Shasta, the largest reservoir in California. Other key features include Friant Dam, Folsom Dam, New Melones Dam, Jones Pumping Plant (formerly known as the Tracy Pumping Plant), and the Contra Costa, Delta-Mendota, and Friant-Kern Canals, and the San Luis Unit. Construction of the CVP began in the late 1930's.

The CVP supplies water to more than 250 long-term water contractors in the CVP service area, whose contracts total 9.3 MAF. Of the 9.3 MAF, 3.1 MAF is water-right settlement water that is delivered to senior water-rights holders.

SOURCE: ESA, 2008

Figure 2-3
Major Components of the Central Valley Project

Water-right settlement water is water covered in agreements with water-rights holders whose diversions existed before the CVP was permitted and constructed. Because the construction of CVP reservoirs altered the natural flow of rivers upon which these diverters had relied, contracts were negotiated to serve stored water to the users to supplement river flows available under their rights. CVP water-right settlement contractors (called “prior right holders”) on the upper Sacramento River receive their supply from natural flow and storage regulated at Shasta Dam; settlement contractors on the San Joaquin River (called “exchange contractors”) receive Delta water via the Delta-Mendota Canal.

The remaining 6.2 MAF is delivered to water contractors as CVP project water supplies. About 90 percent of CVP water has gone to agricultural uses, including water delivered to the prior right holders. CVP water is used to irrigate some 19,000 farms covering 3 million acres. Currently, increasing quantities of water are being served to municipal customers. Urban areas receiving CVP water supply include Redding, Sacramento, Folsom, Tracy, most of Santa Clara County (served by Santa Clara Valley Water District (SCVWD)), north-central and eastern Contra Costa County (served by CCWD), and Fresno. With completion of the FRWP, CVP water supplies would be delivered to portions of Alameda and Contra Costa Counties served by EBMUD during drier years.

Water stored in the northern CVP reservoirs is released to the Sacramento River and eventually enters the Delta. Supplies contracted for delivery are diverted from the Delta via the Contra Costa Canal and the Delta-Mendota Canal. CCWD diversions were described above; the 4,600-cfs Jones Pumping Plant diverts water to the Delta-Mendota Canal. The other CVP supplies are diverted upstream of the Delta by CVP contractors such as Glenn-Colusa Irrigation District and Tehama Colusa Irrigation District. In the future, EBMUD, Sacramento County, and possibly other agencies will also divert CVP water from the Delta at Freeport.

During the winter, unstored water is diverted and conveyed to offstream San Luis Reservoir, on the western side of the valley, for subsequent delivery to the San Luis and San Felipe Units. A portion of the Delta-Mendota exports are returned to the San Joaquin River at Mendota Pool to serve (by exchange) water users who have long-standing historical rights to the use of San Joaquin River flow. This exchange enabled the diversion of a major portion of the flow farther south in the Friant-Kern Canal (and some water northward in the Madera Canal) through the construction of Friant Dam northeast of Fresno.

Operations of the federal facilities in the Delta are coordinated with the SWP to meet water quality and other standards set by the SWRCB, and more recently, pumping limits set by federal fish management agencies such as NMFS and USFWS, and by court order.

Central Valley Project Improvement Act

In 1992, Congress passed the CVP Improvement Act, which added fish and wildlife protection, restoration, enhancement, and mitigation as project purposes with equal priority to existing project purposes of power generation, irrigation, and domestic water uses. The CVP Improvement Act requires the Secretary of the Interior, through Reclamation and the USFWS, “to operate the

CVP consistent with the purposes of the act, to meet the federal trust responsibilities to protect the fishery resources of affected federally recognized Indian tribes, and to achieve a reasonable balance among competing demands for the use of CVP water" (Reclamation, 2005).

Reclamation and USFWS, in coordination with the State of California, participating CALFED agencies, and other partners, have implemented numerous programs to meet the goals of the Act. Two areas of focus have been increasing the number of anadromous fish in Central Valley rivers and streams, and supplying water to Central Valley refuges and other waterfowl habitats.

The goal of the anadromous fish program, as specified in section 3406(b)(1) of the CVP Improvement Act, was for the Department of the Interior "to make all reasonable efforts to at least double, by the year 2002, the "natural" production of six species of anadromous fish in Central Valley rivers and streams over the average levels that existed between 1967 and 1991" (Reclamation, 2005). Many of the programs implemented to achieve this goal focus on the Delta because many species and runs of anadromous fish pass through the Delta and because the Delta environment has been significantly altered in ways that impact fish habitat. The anadromous fish doubling program in the Delta emphasizes operational changes that result in increased stream flows and reduced diversions during sensitive periods for fish. Other measures include installation of a seasonal barrier at the head of Old River (Reclamation, 2005).

The goal of the CVP Improvement Act refuge water supply program is to provide "firm water supplies of suitable quality to maintain and improve wetland habitat areas" on certain Central Valley wildlife refuges (see section 3406(d)). The Act required about 430,000 acre-feet of base refuge supply to be provided immediately, and set a target for supplying an additional 130,000 acre-feet of supplemental water within 10 years. The base supply is routinely provided, but supplemental supplies are not fully provided due to a variety of constraints, including cost and availability of water, pumping capacity, and storage and conveyance infrastructure.

2.3.2 State Water Project

The SWP is the primary state entity for storing and conveying water to supply-deficient areas in California. Water is contracted to 29 local water agencies that are obligated to pay for the SWP's construction and continued operation. Of the 29 contractors, 25 use SWP water primarily for Municipal and Industrial (M&I) purposes, while the remaining 5 use SWP water for primarily agricultural purposes. The water supply contracts were originally entered into in the 1960s. Contracts were signed for an eventual annual delivery of 4.17 MAF (referred to in the contracts as "Table A" water). For the 10-year period from 1995 through 2004, average annual deliveries of Table A water were 2.4 MAF, with a maximum of 3.2 MAF and a minimum of 1.5 MAF (DWR, 2006).

Planning for the multipurpose SWP began in the late 1940s and early 1950s, when it became evident that local and federal water development could not keep pace with California's rapidly growing population. Passage of the Burns-Porter Act in 1960 authorized construction of the facilities. At that time, the plans recognized that there would be a gradual increase in water demand and that some of the supply facilities could be deferred until later. The SWP's major components include Oroville Dam and Reservoir on the Feather River, the Edmund G. Brown California Aqueduct, South Bay Aqueduct, North Bay Aqueduct, and a portion of San Luis Reservoir (shared with Reclamation), as well as the Banks Pumping Plant and Clifton Court Forebay located in the Delta. The Banks Pumping Plant has a capacity of 10,300 cfs; however, due to regulatory restrictions imposed in SWRCB Decision 1641, the pumping capacity is typically limited to 6,680 cfs with some exceptions (DWR, 2008).

Figure 2-4 shows the major components of the SWP, which extend from the Feather River in the north to the East Branch Extension in Riverside County in the south.

In 2004, the SWP delivered 2.6 MAF of Table A supplies, and about 1.8 MAF of other water including water to meet obligations to water right holders on the Feather River (DWR, 2006). About 75 percent of the Table A deliveries serve M&I land uses, while the remaining 25 percent is delivered for agricultural supplies (DWR, 2006). The volume of water available for delivery to SWP water users varies annually according to hydrologic conditions and system operations.

DWR issued its *SWP Delivery Reliability Report 2007* in August 2008. The report indicates the probable volumes of water that could be relied upon during various dry-year conditions. The results of this study, shown in **Table 2-2**, indicate that the volume of water available for delivery during a 2-year drought would decline to about 54 percent of average deliveries under 2007 conditions, and to about 40 percent of average deliveries under 2027 conditions (DWR, 2008).

TABLE 2-2
STATE WATER PROJECT
AVERAGE AND DRY-YEAR DELIVERIES
(Percentage of Full Table A Amounts)

Year	Average (1922–1994)	Single Dry Year (1977)	2-Year Drought (1976–1977)	Percentage of Average
2007	63	6	34	54
2027	66 - 69	7	26 - 27	40

SOURCE: DWR, 2008.

2.3.3 Coordinated Operations of the Central Valley Project and State Water Project

The federal government and the State of California entered into the Coordinated Operations Agreement in 1986. This agreement established a set of procedures for coordinated operations of the CVP and SWP, including formulas for sharing responsibility in meeting Delta water quality standards, sharing unstored flows, and exchanging water and services between the CVP and SWP. Because both the CVP and SWP use the Sacramento River and Delta as common conveyance facilities, upstream reservoir releases and diversions from the Delta must be coordinated to ensure each entity’s use of available water supplies and to meet obligations to protect other beneficial

SOURCE: ESA, 2008

Figure 2-4
Major Components of the State Water Project

uses (Reclamation, 2004). Compliance with Delta water quality standards and federal and state Endangered Species Acts (ESAs) drives much of the coordinated operations.

Delta Water Quality Standards. The 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary*, prepared by the SWRCB, defines Delta water quality standards that must be met by the CVP and SWP. The SWRCB issued Decision 1641, which amended certain terms and conditions to the CVP and SWP water rights, including the water quality objectives adopted in the water quality control plan. The standards expressed in the plan and enforced through Decision 1641 are for the protection of fish and wildlife, M&I water quality, agricultural water quality, and Suisun Marsh salinity. The SWRCB adopted an amended Water Quality Control Plan for the Bay-Delta in December 2006 that addresses new issues such as Pelagic Organism Decline (SWRCB, 2006).

ESA Compliance. For purposes of consultation with USFWS and NMFS under Section 7 of the federal ESA for operation of the CVP, Reclamation prepared and periodically updates a CVP Operations Criteria and Plan (OCAP) that describes the facilities and operating environment of both the CVP and SWP. This plan identifies the factors influencing the physical, regulatory, and institutional conditions in which the coordinated projects operate. The plan identifies and evaluates typical operating strategies under various hydrologic conditions.

In 2004, Reclamation released an updated OCAP addressing the coordinated operations of the CVP and SWP. The corresponding biological opinions, issued by NMFS and USFWS, were found by a federal court to be deficient. The court issued an Interim Order setting flow requirements to be used until new biological opinions were issued. Reclamation reissued OCAP in 2008 and subsequently reinitiated Section 7 consultation in accordance with the federal ESA. A new OCAP biological opinion for delta smelt was issued by USFWS in December 2008, and a new OCAP biological opinion for salmon and steelhead is expected to be issued by NMFS in mid-summer 2009.

The analyses pertaining to operations of the SWP and CVP in this document are based on the Interim Order issued by the federal court and the 2004 OCAP. Because NMFS has not yet issued its biological opinion, it is not yet possible to assess the changes to SWP and CVP operations that may occur due to the combined effects of the USFWS and NMFS biological opinions for 2008 OCAP. Reclamation and DWR intend to complete an analysis of the effects that the new biological opinions will have on the operations of SWP and CVP. It is possible that the new opinions may result in moderate to severe fishery restrictions being imposed on Delta exports, depending on annual hydrologic conditions, above and beyond those caused by the Interim Order. The analysis of the effects of the new biological opinions on the operations of the SWP and CVP will be described in the Final Federal Feasibility Report and the Final EIS/EIR for this project.

For purposes of complying with the state and federal ESAs, DWR and Reclamation have initiated the Bay Delta Conservation Plan (BDCP), which is further described in Section 2.4.

2.3.4 In-Delta Water Uses

Water use in the Delta region averages about 1.7 MAF per year, with the majority used for agriculture. Most of the agricultural water is directly diverted by farmers through unscreened diversions under riparian or pre-1914 water rights. There are about 1,800 irrigation diversions in the Delta. Drainage water from farming operations is pumped back to the Delta waterways. A small amount of water also goes to urban uses, including diversions by CCWD, the City of Antioch, and industries along the Pittsburg-Antioch shoreline. The CVP and SWP are operated to meet water quality standards that are in place to protect water quality for in-Delta users (DWR, 2005).

2.4 Water Use Efficiency, Water Conservation, and Water Recycling

2.4.1 CCWD Service Area

CCWD recognizes the need for continuing efforts to improve water use efficiency and has a successful track record of reducing water use despite an increasing population. CCWD signed and adheres to the Urban Water Conservation Memorandum of Understanding (renewed in 1997), and has implemented conservation Best Management Practices since 1991.

From 1987 through 1990, the amount of water used within CCWD's service area derived from Delta supplies was about 140,000 acre-feet per year. Water use efficiency efforts, including residential, commercial, industrial, and institutional conservation, and recycled water use in CCWD's service area have reduced water use derived from Delta supplies to 118,000 acre-feet per year (2004 through 2007), despite a population increase of about 40 percent since 1986. Recycled water use in CCWD's service area is about 8,500 acre-feet per year and is expected to climb to about 13,000 acre-feet per year by 2010. CCWD's conservation savings are planned to more than double by 2020 (CCWD, 2005). CCWD has supported efforts to set a goal of reducing urban per capita water use by 20 percent by 2020.

2.4.2 Bay Area Region

The Bay Area as a whole has also reduced water use despite an increasing population. From 1986 to 2005, Bay Area population increased by about 21 percent, while M&I water use only increased by about 3 percent. Recycled water use within the region was about 56,000 acre-feet per year in 2005, with plans to double that by 2020 (BAWAC, 2005).

Agencies on the South Bay Aqueduct (Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7), Alameda County Water District, and SCVWD) have signed and adhere to the Urban Water Conservation Memorandum of Understanding and have implemented conservation Best Management Practices. All three agencies have aggressive water use efficiency programs and plans to increase water conservation and recycling efforts into the future.

2.5 Other On-going Planning Processes

2.5.1 Delta Vision

Delta Vision is a planning process initiated by the Governor of the State of California through Executive Order S-17-06 that established an independent Blue Ribbon Task Force responsible for development of a durable vision for sustainable management of the Delta. A cabinet-level Delta Vision Committee was appointed to oversee the process. The Delta Vision Committee appointed a 43-member Stakeholder Coordination Group and two science advisors to provide input to the Task Force and Committee.

The work of the Task Force included two phases: the Vision, which was completed in December 2007, and the Strategic Plan, which was completed by the Task Force and sent to the Committee in November 2008 (Delta Vision Blue Ribbon Task Force, 2007 and 2008). The Committee prepared its report to the Governor, which was released to the public on January 2, 2009 (Delta Vision Committee, 2008). Key recommendations include significant increases in conservation and water system efficiency and new water conveyance and storage facilities. The report also recommends actions that include improving flood protection, implementing high priority ecosystem restoration projects, and pursuing conveyance and storage system improvements as rapidly as possible. The Los Vaqueros Reservoir Expansion Project, like all the CALFED Program storage projects, is consistent with the Delta Vision recommendations, but independent of the planning effort. Decisions on whether and how to proceed with any of the alternatives evaluated in this EIS/EIR are not tied to implementation of the Delta Vision.

2.5.2 Bay Delta Conservation Plan

The BDCP is a conservation plan being prepared to meet the requirements of section 10 of the federal ESA, and either section 2835 or section 2081 of the State Fish and Game Code. DWR and state and federal water contractors intend to apply for Incidental Take Permits for water operations and management activities in the Delta. The BDCP will also be used, if feasible, by Reclamation as the basis for federal ESA section 7 compliance, resulting in the issuance of biological opinions and Incidental Take Permits to Reclamation for their participation and implementation of the BDCP. These incidental take authorizations will allow for the incidental take of threatened and endangered species resulting from covered activities and conservation measures associated with water operations of the SWP and CVP, including facility improvements and maintenance activities, operational activities related to water transfers, new Delta conveyance facilities, and habitat conservation measures included in the BDCP.

Entities seeking incidental take coverage through the BDCP include Reclamation, DWR, Metropolitan Water District of Southern California, Kern County Water Agency, SCVWD, Zone 7, San Luis Delta Mendota Water Authority, Westlands Water District and Mirant Delta. The BDCP will likely include capital improvements for water supply conveyance, ecological restoration, monitoring, and adaptive management.

The BDCP is in the early stages of planning. A Notice of Preparation of a joint EIR/EIS was issued by DWR on March 17, 2008. A Notice of Intent to prepare an EIR/EIS and conduct scoping meetings was issued by Reclamation, USFWS, and NMFS on April 15, 2008.

The reservoir expansion project is not a covered activity in the BDCP; decisions on whether and how to proceed with any of the project alternatives evaluated in this EIS/EIR are not tied to completion or implementation of the BDCP.

2.5.3 OCAP Biological Opinions

USFWS and NMFS issued biological opinions for the OCAP in 2005 and 2004, respectively. These biological opinions covered the effect of the joint operations of the SWP and CVP on federally listed threatened and endangered species and their critical habitat. USFWS issued a new OCAP biological opinion in December 2008, as required by federal court order in *Natural Resources Defense Council v Kempthorne* (2007). NMFS is currently preparing a new OCAP biological opinion as required by federal court order in *Pacific Coast Federation of Fishermen's Associations v Gutierrez* (2008). This biological opinion is expected in mid-summer 2009. The new OCAP biological opinions will cover current operations of the SWP and CVP. See section 2.3.3 above for additional information on OCAP and ESA compliance.

2.5.4 Integrated Regional Water Management

Numerous regional and local water supply planning efforts are ongoing within the Bay-Delta Area. CCWD participates in two Integrated Regional Water Management Plans (IRWMPs): the Bay Area IRWMP and the East Contra Costa County IRWMP. Both of these IRWMPs emphasize collaboration among water management agencies to provide multiple benefits, and cost-effective and sustainable solutions to water supply and water quality challenges.

The reservoir expansion project is not included in either of these IRWMPs because at the time those plans were being prepared the reservoir expansion project was being studied in coordination with the overall CALFED Storage Program. However, numerous projects to improve water supply reliability and water quality are included in the plans, such as conservation, recycled water, regional interties, desalination and groundwater development, treatment, and banking. **Figure 2-5** shows the major regional water supply infrastructure serving the Bay Area agencies along with specific locations of system interties among agencies. Decisions on whether and how to proceed with any of the project alternatives presented in this EIS/EIR are not tied to the outcome of any IRWMPs.

SOURCE: USGS, 1993 (base map); and ESA, 2008

Figure 2-5
Bay Area Water Agencies –
Regional System Facilities and Interties

CHAPTER 3
Description of Project Alternatives

3.1 Introduction

3.1.1 Chapter Overview

This chapter describes the alternatives for the proposed Los Vaqueros Reservoir Expansion Project, including the four action alternatives and the No Project/No Action Alternative. The four action alternatives are summarized in Section 3.1.2 and described in more detail in Section 3.4.

The chapter is organized as follows:

- Section 3.2 describes the process that was used to develop the action alternatives, the process that was used to screen the eight action alternatives that were developed, and the four alternatives that were eliminated from further evaluation.
- Section 3.3 provides a detailed description of the No Project/No Action Alternative.
- Section 3.4 provides a detailed description of the four action alternatives.
- Section 3.5 describes the proposed facilities under the four action alternatives in terms of location, site layout, and chief design and operational characteristics.
- Section 3.6 describes the construction activities that would occur in the Proposed Project (all four action alternatives).
- Section 3.7 describes the approvals and permits that would be required to implement the Proposed Project.

3.1.2 Summary of Action Alternatives Evaluated in This Draft EIS/EIR

This section contains a summary of the four action alternatives. The action alternatives represent different combinations of facility options and water system operations for expanding the Los Vaqueros Reservoir (reservoir), as well as associated water conveyance.

The facility options are distinguished by the amount of expansion of the reservoir capacity (i.e., from the existing 100 thousand acre-foot (TAF) to 160 TAF or to 275 TAF) and whether a new conveyance pipeline connecting the expanded reservoir to the South Bay water agencies via the State Water Project (SWP) Bethany Reservoir at the South Bay Pumping Plant (South Bay

Connection) is included in the project. The South Bay water agencies include Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7); Alameda County Water District (ACWD); and Santa Clara Valley Water District (SCVWD).

- **Expanded Reservoir Capacity.** Reservoir capacity is a key distinguishing factor because impacts to terrestrial habitat, including wetlands and other habitat for endangered and threatened species, are correlated with the size of the reservoir inundation. The smaller expansion (160 TAF) would require fewer and/or smaller facilities, which could avoid or reduce construction-related impacts on agriculture, traffic, and air quality. However, many of the benefits of an expanded reservoir capacity (e.g., environmental, emergency and dry-year storage, delivered water quality) are proportional to capacity; the larger capacity would result in greater benefits.

- **South Bay Connection.** The South Bay Connection is also a key distinguishing factor because, with such a connection, Los Vaqueros Reservoir system screened pumps could be used to divert SWP water for the South Bay water agencies and Central Valley Project (CVP) water for SCVWD. These agencies currently receive their SWP and CVP water through the CVP and SWP Delta export pumps, which have been subject to increasing regulatory restrictions to protect fish. Using the more effectively screened Los Vaqueros Reservoir system intakes in place of the SWP and CVP facilities is anticipated to greatly reduce the impact of this water delivery on Delta fish by reducing the mortality associated with the current salvage operation at the CVP and SWP Delta export pumps and allowing a pumping schedule that improves protection of aquatic species. An analysis of this effect is presented in Section 4.3. The South Bay Connection could also improve water supply reliability for the South Bay water agencies. On the other hand, eliminating the South Bay Connection could avoid or reduce construction-related impacts on agriculture, traffic, and air quality.

The two primary objectives for all of the action alternatives are to (1) develop water supplies for environmental water management (Environmental Water Management) and (2) increase water supply reliability for Bay Area water providers (Water Supply Reliability). The manner in which the alternatives operated would determine to what extent the primary objectives were achieved. A secondary objective for all of the action alternatives is to improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area without impairing the project's ability to meet the environmental and water supply reliability objective (Water Quality). See Chapter 1 for a discussion of project purpose, need, and objectives.

Assumptions regarding operations were chosen to bracket a range of potential operations and associated impacts. The adverse impacts of the actual water delivery operations selected for the project, if approved, are expected to fall within this range. The project benefits, on the other hand, could be greater than those identified in this Draft EIS/EIR because operation of any selected alternative would be adaptively managed to maximize project benefits without increasing adverse environmental impacts. The extent of the benefits achieved in each of these areas will depend on several factors, including future Delta conveyance and habitat improvements, Delta operations requirements, and the project's precise environmental water management actions as further developed in project permits and agreements with project partners.

There are various ways to operate the alternatives to achieve the project objectives. These operations are defined below. The operations are used in different combinations in the alternatives to yield different sets of benefits.

- **Environmental Water Management.** The project alternatives would result in varying degrees of improvement in environmental water management depending on the water system operations that were implemented. Depending on the alternative, operations to improve environmental water management would include:

  - Improved Fish Screening – The expanded reservoir system would only divert water through state-of-the-art positive barrier fish screens designed and operated to regulatory agency specifications. Shifting the pumping of SWP and CVP supplies for South Bay water agencies to the more effectively screened Los Vaqueros Reservoir system intakes would result in fewer impacts to fish than the same amount of water diverted from either the SWP or CVP export facilities. SWP and CVP Delta export pumping would be correspondingly reduced either concurrently or when fish species were better protected.

  - No-Diversion Period – Additional storage in the expanded reservoir would provide operational flexibility to reduce Delta diversions during the most sensitive fish period without disrupting supplies. Permits to operate the existing reservoir require a 30-day no-diversion period during the most critical spring fish period. Shifting the South Bay water agencies diversions to the expanded reservoir system would allow the extension of the no-diversion period to approximately three times the current amount, while still making the water deliveries to the participating agencies. Water demands during the no-diversion period would be met through storage releases from the expanded reservoir.

  - Multiple Delta Intake Locations – Water would be diverted to the expanded reservoir system through two or three separate Delta intakes depending on the alternative. Multiple points of diversion would provide flexibility to respond to changing fishery conditions in the Delta.

  - Dedicated Storage for Environmental Water – A portion of the additional storage capacity in the expanded reservoir would be dedicated to storage for environmental water supplies for Central Valley refuges, instream flows, and other environmental water needs.

- **Water Supply Reliability.** The project alternatives would result in varying levels of increase in water supply reliability. Depending on the alternative, operations to increase water supply reliability would include:

  - Delta Supply Restoration – The expanded reservoir system would be used to partially restore delivery reductions to the South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the SWP and CVP Delta export pumps.

  - Dry-Year Storage – Additional storage in the expanded reservoir would be used to meet dry-year needs for Contra Costa Water District (CCWD) and the South Bay water agencies. Subsequently, the need to purchase supplemental dry-year supplies, activate dry-year exchange programs, or institute drought management measures would also be reduced. The expanded reservoir would allow more storage of water in wet periods for use in dry periods.

- Emergency Storage – Additional storage in the expanded reservoir would be available for delivery to Bay Area water agencies through the South Bay Connection or existing interties in the event of a levee failure, chemical spill, or other emergency.

The key distinguishing characteristics of the four action alternatives that are evaluated in this Draft EIS/EIR are shown in **Table 3-1**. Each action alternative is described in detail in Section 3.4. The No Project/No Action Alternative is described in Section 3.3.

TABLE 3-1
KEY DISTINGUISHING CHARACTERISTICS OF THE FOUR ACTION ALTERNATIVES

Key Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Capacity	275 TAF	275 TAF	275 TAF	160 TAF
New South Bay Connection?	Yes	Yes	No	No
Operational Emphasis	Environmental Water Management Water Supply Reliability	Environmental Water Management	Environmental Water Management	Water Supply Reliability
Key Operations	Improved Fish Screening No-Diversion Period Delta Supply Restoration Dry-Year and Emergency Storage	Improved Fish Screening No-Diversion Period Dedicated Storage for Environmental Water Dry-Year and Emergency Storage	No-Diversion Period Dedicated Storage for Environmental Water Dry-Year and Emergency Storage	No-Diversion Period Dry-Year and Emergency Storage

TAF = thousand-acre foot

All of the action alternatives assume that the expanded reservoir would operate to ensure that CCWD continued to receive the water quality and emergency storage benefits associated with the Los Vaqueros Reservoir.

Filling of the expanded reservoir would occur during periods of low salinity to maintain the water quality benefits of the existing reservoir. Filling would be subject to the no-diversion period described above.

Water Rights and Coordinated Operations

None of the alternatives would involve diverting more water from the Delta than allowed under existing water rights or changing the ownership or priority of those water rights. The project would change the timing and location of diversions such that fish protection, environmental water management, and Bay Area water supply reliability would improve. These changes may necessitate modification of existing water right permits held by CCWD; U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation); and/or California Department of Water Resources (DWR).

In addition to its long-term contract with Reclamation, CCWD has separate water rights for the Los Vaqueros Reservoir. CCWD's separate Los Vaqueros water rights are subject to permit terms and conditions to ensure that exercising those water rights does not adversely affect the CVP and SWP operations under the water right permits held by Reclamation and DWR, respectively. Under all alternatives, the use of the collective water rights of the project participants would be coordinated to operate the existing and new facilities in a manner designed to accomplish the project objectives without adversely affecting CVP and SWP operations. This would be achieved through agreements among the parties and permit changes as necessary.

Fishery Protection Measures and Delta Operations

Operational restrictions imposed on the SWP and CVP to protect fishery resources are an important part of the background conditions in the Delta. There is, however, considerable uncertainty regarding both what the regulations will be and how they will be implemented from year to year. To capture the likely range of operations with fishery restrictions, both current and future, and the resulting SWP and CVP operations, two scenarios were simulated. The "moderate fishery restriction" scenario represents the least restrictive set of requirements that can be expected under current and future regulatory conditions. The "severe fishery restriction" scenario captures the most restrictive requirements that can be expected. Analyses using both the moderate and severe fishery restriction assumptions were used to bracket the range of background conditions that are likely to occur in any year and to evaluate the environmental effects of the project alternatives under this range of conditions. The assumptions used to estimate these restrictions are described in Appendix C-3.

If other restrictions are imposed in the future, they will be analyzed to determine whether they would result in change. If the analyses indicate a new or substantially more severe impact would occur, a supplemental environmental review under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) would be required prior to taking further actions.

3.2 Development and Screening of Alternatives

This section presents a summary of the alternatives development and screening process implemented to identify the action alternatives that were evaluated in this Draft EIS/EIR

3.2.1 NEPA and CEQA Requirements

NEPA and CEQA require consideration of a range of alternatives to a Proposed Action that could potentially attain most of the basic project objectives and accomplish the project purpose and need while avoiding or minimizing environmental impacts. The purpose of including alternatives in an

EIS/EIR is to offer a clear basis for choice by the decision makers and the public as to whether or how to proceed with the Proposed Action or project. An EIS/EIR must also consider the No Action (NEPA) and No Project (CEQA) alternative.

NEPA Requirements

According to NEPA regulations (40 CFR 1502.14, Alternatives Including the Proposed Action), the alternatives section of an EIS is required to provide a rigorous exploration and objective evaluation of all reasonable alternatives, including the "No Action Alternative." The discussion of alternatives must present the impacts of the alternatives in sufficient detail to permit a reasoned choice between the alternatives. For alternatives that are not carried forward for detailed study, the EIS must include a brief discussion of the basis for this decision (see Section 3.2.3 and Appendix B, Alternatives Development). NEPA requires substantial analysis of all the alternatives so that their comparative merits may be evaluated (40 CFR 1502.14[b]).

CEQA Requirements

CEQA requires that an EIR include a discussion of alternatives to the Proposed Project to enable an evaluation of whether there are other means of achieving the project's basic goals and objectives while avoiding or reducing the environmental effects of the project. Section 15126.6(b) of the CEQA Guidelines states that:

> … the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or could be more costly.

Pursuant to Section 15126(d) of the CEQA Guidelines, an EIR must describe and evaluate a reasonable range of alternatives that could potentially attain most of the basic project objectives and would avoid or substantially lessen any of the significant impacts of the Proposed Project. Section 15126.6(f) of the CEQA Guidelines provides guidance on the extent of the alternatives analysis required:

> The range of alternatives required in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision-making.

As described under Section 15126.6(d) of the CEQA Guidelines:

> The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the Proposed Project. A matrix displaying the major characteristics and significant environmental effects of each alternative may be used to summarize the comparison. If an alternative would cause one or more significant effects in

> addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the project as proposed.

Section 15126.6(e)(1) of the CEQA Guidelines also requires analysis of a "No Project Alternative." The purpose of evaluating the No Project Alternative is to allow decision-makers to compare the potential consequences of the project with the consequences that would occur without implementation of the project.

3.2.2 Alternatives Screening

CCWD, Reclamation, and other interested agencies have worked together on an alternatives development and screening process to identify and evaluate actions that could meet the established project objectives. Appendix B, Alternatives Development, describes the alternatives development and screening process that led to the identification of the four action alternatives evaluated in this Draft EIS/EIR. The process is summarized below.

Initial Identification and Screening of Alternatives

The first step in developing alternatives was to identify and evaluate potential initial concepts that could address one or more project objectives. More than 30 initial concepts were identified and rated on a scale of high to low based on their relative ability to address the primary and secondary objectives of the project.

In most cases, the initial concepts that were rated as moderately or less-than-moderately addressing a project objective were deleted from further consideration, while concepts rated higher were retained. In addition to screening based on ability to meet one or more of the project objectives, concepts were eliminated based on engineering (including cost), environmental, political, and institutional constraints relative to other available options.

The results of the initial screening are presented in **Table 3-2**. Of the more than 30 initial concepts evaluated, seven were retained for further consideration. The seven concepts were packaged into eight project alternatives representing a range of project options combining various elements of the retained concepts and emphasizing the primary project objectives to different degrees. (See the *Initial Alternatives Information Report* (Reclamation, 2005) for additional information.) The eight alternatives are:

1. Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability
2. Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability
3. Construct Desalination Facilities and additional storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability
4. Enlarge Los Vaqueros Reservoir with South Bay Aqueduct (SBA) Intertie at Dyer Canal for Environmental Water Management

TABLE 3-2
INITIAL CONCEPTS TO MEET PROJECT OBJECTIVES

Initial Concept	Potential to Address Project Objective	Status and Rationale
Surface Water Storage		
Enlarge Los Vaqueros Reservoir to increase conservation storage space (300 to 500 TAF total storage)	High – Could provide up to 400 TAF of new local storage for water supply reliability, and has potential to contribute to other project planning objectives	Retained – Specifically authorized for study; could contribute to other project planning objectives
Raise Los Vaqueros Dam In-Place to increase conservation storage space (115 to 275 TAF total storage)	Moderate to High – Could provide up to 175 TAF of new local storage for water supply reliability; has potential to contribute to other project planning objectives	Retained – Raising in-place potentially less costly than new enlarged dam; smaller increment of storage; could contribute to other project planning objectives
Raise Calaveras Dam to increase conservation storage space	Low – Could provide up to 320 TAF of local storage, but would only benefit agencies with existing SFPUC contracts (ACWD and SCVWD)	Deleted – Low potential to provide regional supply reliability benefits in the Bay Area
Enlarge San Luis Reservoir to increase conservation storage space	Low – Could provide up to 200 TAF but would serve only one agency (SCVWD)	Deleted – High unit cost; low potential to contribute to increasing regional Bay Area water supply reliability
Raise Pacheco Dam to increase conservation storage space	Low – Could provide up to 120 TAF but would serve only one agency (SCVWD)	Deleted – High unit cost; low potential to contribute to increasing water supply reliability in the project study area; limited potential to support other objectives
Construct new conservation storage at Upper Lake Del Valle Dam site	Low – Could capture up to 15 TAF local runoff, but effectiveness would depend on expansion of the SBA by DWR	Deleted – Effectiveness would depend on actions by others; low potential to provide regional benefits; high unit cost compared with other concepts
Construct other local area storage facilities considered as alternatives to the original Los Vaqueros Project	Moderate – Various sites could provide small to moderate increase in local storage	Deleted – Major site acquisition issues; high likelihood of local opposition; high unit cost
Construct new conservation storage in Sacramento River/San Joaquin River watersheds	Low – Various sites could provide small to moderate storage outside the project study area	Deleted – Low potential to address project planning objectives; most promising sites evaluated by ongoing CALFED studies
Construct new conservation storage in the Sacramento-San Joaquin Delta	Low – Uncertainty regarding ability to provide water supply reliability benefits to the project study area	Deleted – Low potential to address project planning objectives; most promising sites evaluated by ongoing CALFED studies
Reservoir/System Reoperation		
Increase effective conservation storage space in existing Lake Del Valle Reservoir	Low – Small potential to provide water supply reliability benefits to project study area without affecting other reservoir functions	Deleted – Low potential to provide regional water supply reliability benefits; high unit cost compared with other concepts
Improve Delta export and conveyance capability through coordinated CVP and SWP operations	Low – Limited potential for additional reoperation benefits beyond current plans	Deleted – Joint Point of Diversion and other system efficiency improvement concepts are being actively pursued in other programs

TABLE 3-2 (Continued)
INITIAL CONCEPTS TO MEET PROJECT OBJECTIVES

Initial Concept	Potential to Address Project Objective	Status and Rationale
Groundwater Storage		
Develop additional groundwater banking in San Joaquin River watershed	Low – Existing banks have sufficient capacity to store unused contract supplies; uncertainty regarding ability to secure additional supplies for banking and withdrawal limitations	Deleted – Existing Bay Area programs sufficient to store unused contract water; limited available capacity in current and planned banks
Develop additional groundwater banking in Sacramento River watershed	Low – Significant physical limitations to banking in Sacramento River watershed	Deleted – Low likelihood of developing a reliable conjunctive-use program for Bay Area supplies in the Sacramento River basin due to significant physical, groundwater, and other related problems
Conveyance/System Modifications		
Increase Delta diversion capacity to Bay Area water agency facilities	Moderate – Increased export capacity could provide water supply reliability benefits, particularly in combination with storage	Retained – Additional Delta diversion capacity with enlarged capacity at existing site and/or new central Delta diversion likely to be effective when used in combination with reoperation and/or new storage
Construct intertie from SFPUC to the SBA	Low – Uncertainty regarding availability of Hetch Hetchy supplies and ability to provide regional benefits	Deleted – Low potential to contribute to overall water supply reliability conditions in the project study area; could be independently implemented; would have limited contribution to other project planning objectives
Expand use of Freeport Regional Water Project	Low – Little potential to improve water supply reliability because benefits would be limited to surplus project capacity during wet periods	Deleted – Very high capital and unit costs; benefits would be limited primarily to wet years
Increase Banks Pumping Plant capacity to greater than 8,500 cfs	Low – Limited potential to benefit water supply reliability in the project study area due to physical and regulatory constraints on increased exports	Deleted – Limited potential for increased water supply reliability in the project study area; limited potential to contribute to other project planning objectives
Construct an intertie from Los Vaqueros Reservoir to the SBA upstream from Dyer Canal	Moderate – Could provide water supply reliability benefits to the South Bay water agencies with reoperation or expansion of Los Vaqueros	Retained – New conveyance from Los Vaqueros Reservoir to the SBA would be an important component of any reservoir expansion action
Construct intertie from Los Vaqueros Reservoir to the SBA via Bethany Reservoir	Low – Although this measure could provide water supply reliability benefits to the South Bay water agencies similar to the previously described Dyer Canal intertie, it would be much more costly because of increased pumping from Bethany Reservoir	Deleted – An SBA intertie at Bethany Reservoir was deleted as a measure for water supply reliability due to estimated high operations and maintenance costs; Retained – As a measure for plans focused on developing supplies for environmental water management

TABLE 3-2 (Continued)
INITIAL CONCEPTS TO MEET PROJECT OBJECTIVES

Initial Concept	Potential to Address Project Objective	Status and Rationale
Source Water Treatment Improvement		
Implement treatment/supply of agricultural drainage water	Low – Uncertain ability to treat agricultural runoff to a quality standard acceptable to the public	Deleted – Very costly; low certainty of success; likely low acceptability by stakeholders and general public
Construct desalination facility	Moderate – Potential to provide base water supply but would require storage to provide dry-year water supply reliability benefits	Retained – Limited application as a dry-year supply; high unit cost; potential environmental impacts from treatment byproducts; potential to provide benefits in combination with storage
Demineralize poor quality groundwater	Low – Limited groundwater resources in the project study area suitable for additional development; highly localized benefits	Deleted – High implementation costs; limited application and benefits; potential for adverse impacts to groundwater resources
Water Use Efficiency		
Implement additional wastewater reclamation	Low – Could provide localized supply reliability benefits, limited by acceptable uses of recycled water	Deleted – Measure being actively pursued by other CALFED Programs and by individual agencies in the Bay Area
Implement additional demand management facilities	Low – Low potential to significantly address dry-year water supply reliability over and above existing/planned conservation programs	Deleted – Would not effectively address project planning objectives and constraints/criteria; features being actively pursued by other CALFED Programs and by individual agencies in the Bay Area[1]

KEY:
ACWD = Alameda County Water District
Bay Area = San Francisco Bay Area
CALFED = CALFED Bay-Delta Program
cfs = cubic foot (feet) per second
CVP = Central Valley Project
DWR = Department of Water Resources
SBA = South Bay Aqueduct
SCVWD = Santa Clara Valley Water District
SFPUC = San Francisco Public Utilities Commission
SWP = State Water Project
TAF = thousand acre-feet

1 Ongoing conservation programs in Bay Area are included in the No Project/No Action Alternative

5. Enlarge Los Vaqueros Reservoir with SBA Intertie at Bethany Reservoir for Environmental Water Management

6. Enlarge Los Vaqueros Reservoir with SBA Intertie at Dyer Canal with Water Supply Reliability / Environmental Water Management dual emphasis

7. Enlarge Los Vaqueros Reservoir with SBA Intertie at Bethany Reservoir with Water Supply Reliability / Environmental Water Management dual emphasis

8. Enlarge Los Vaqueros Reservoir with SBA Intertie at Dyer Canal and operate to improve delivered water quality and also contribute to Water Supply Reliability and Environmental Water Management

Alternatives Analysis

Further studies were conducted on the eight alternatives, including analyses of simulated project operations and more detailed assessment of engineering, environmental, regulatory, and cost factors. The analyses resulted in the identification of four comprehensive project alternatives for further detailed evaluation in this Draft EIS/EIR.

As a result of additional engineering studies, the alternative based on raising the dam in place was modified. Initially, the raise-in-place concept resulted in a “mini” raise of up to 115 TAF total capacity. Subsequent engineering studies determined that it would be possible to raise the existing dam in-place to achieve a moderate reservoir expansion of up to 275 TAF total capacity. The moderate dam raise scenario offers substantial potential cost savings over the larger expansion alternative because portions of the existing dam structure and associated facilities could be preserved and reused as part of the enlarged reservoir system. An alternative with expansion of the reservoir to 275 TAF was added to the list and evaluated in the *Initial Economic Evaluation for Plan Formulation Report* (Reclamation, 2006). From that analysis, it was concluded that the moderate reservoir expansion concept was economically feasible and appeared to be more cost effective than the larger reservoir expansion option in meeting project objectives. Consequently, the expansion to 275 TAF is the largest reservoir expansion considered in this Draft EIS/EIR and is part of three action alternatives.

3.2.3 Alternatives Not Carried Forward

The following four alternatives were not carried forward from the alternatives plan phase for detailed study in this Draft EIS/EIR:

- Desalination with storage (enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability. This alternative was not advanced for further study primarily because of potential environmental issues related to energy use and disposal of brine. Additionally, it represented among the highest cost per unit of water supply developed under any of the plans considered.

- Enlarge Los Vaqueros Reservoir with SBA Intertie at Dyer Canal for Environmental Water Management. This alternative was not advanced for further study because it would be less effective at meeting the environmental water objective than the alternative including an intertie with Bethany Reservoir, which was advanced. In addition, environmental assessment of this intertie alignment indicated that it had greater potential environmental impacts (primarily with respect to biological and cultural resources) than did the Bethany Reservoir conveyance alignment.

- Enlarge Los Vaqueros Reservoir with SBA Intertie at Dyer Canal with Water Supply Reliability / Environmental Water Management dual emphasis. As discussed for the previous alternative, this alternative also was not advanced for further study because the intertie with the SBA at Dyer Canal would be less effective at meeting the dual project objectives than the alternative including an intertie to Bethany Reservoir. This conveyance alignment also had greater potential environmental impacts than the Bethany Reservoir alternative, which was advanced for further analysis.

- Enlarge Los Vaqueros Reservoir with SBA Intertie at Dyer Canal and operate to improve delivered water quality and also contribute to Water Supply Reliability and Environmental Water Management. Similar to the two previous alternatives, this alternative also included a SBA intertie, which was not as effective in meeting the project objectives as is the Bethany Reservoir intertie advanced for further study and was not an environmentally superior alternative. In addition, this alternative represented among the highest cost per unit of water of the alternatives considered to address the combined project objectives.

3.2.4 Facilities Siting – Alternatives Screening

In addition to the development and screening of comprehensive project alternatives, a facilities siting process was also conducted. The purpose of the siting studies was to help define the alternatives, identify location constraints, outline the areas to be evaluated in the Draft EIS/EIR, and potentially avoid environmental impacts. Several of the key siting studies are summarized below.

New Delta Intake and Pump Station. Nine potential intake locations on Old and Middle Rivers in the vicinity of Victoria Island were evaluated in 2001–2002. Each intake location was evaluated for engineering, biological, cultural resources, and land use criteria. The purpose was to determine whether siting issues would drive the location of the intake and therefore influence the modeling for water quality effects. No compelling differences were found among the sites, allowing the water quality analysis, hydrologic modeling results, and fisheries analysis to establish the preferred locations.

Recreational Facilities. Recognizing that expansion of the Los Vaqueros Reservoir to any level would affect the existing recreational facilities including the Marina, picnic areas, fishing piers and trails, a study to identify relocation sites was conducted in 2003. Factors considered included slope, wind, biological constraints, cultural resources constraints, and access. Marina sites at both the southern and northern ends of the reservoir were identified, as were sites for relocation of fishing areas and picnic areas, a potential new eastside trail system, and possible addition of a new interpretive center. The results of the recreational studies are documented in the *Draft Recreation Evaluation Technical Memorandum Draft* (ESA, 2004).

Conveyance Facilities. The *Facilities Siting Report* (ESA, 2007) contains a description of the results of a multi-year, multi-discipline series of studies conducted to develop and evaluate alternative locations for the principal components of the water conveyance system for an expanded reservoir of up to 500 TAF. The report documents a comprehensive and systematic approach taken for facility site identification, evaluation, and screening. Sites were reviewed for engineering, constructability, and environmental considerations.

A number of sources were used to complete the facilities siting analysis including published literature, recent aerial photographs, geology, soils, and slope stability maps, previous Los Vaqueros Reservoir Expansion Project reports and maps for the Los Vaqueros Watershed, and other publicly available databases such as the *East Contra Costa County Habitat Conservation Plan and Natural Communities Conservation Plan (HCP/NCCP)* (ECC HCPA, 2006) and previously recorded cultural resource sites from the Northwest Information Center. The analysis relied heavily on Geographic Information System (GIS) assessment to determine the range and magnitude of potential effects, to quantify siting results, and to illustrate various facility configurations. In October 2004, analysts visited or viewed all the facility alternatives that were accessible within the Los Vaqueros Watershed or visible from public roads. Facility sites and pipeline alignments were further refined to avoid or minimize environmental impacts or to improve conditions for construction.

To achieve a systematic approach to facility siting evaluation, siting criteria were developed for engineering, biological resources, cultural resources, and land use. The siting criteria within each category were posed as a series of questions, for which answers were categorized into high, medium, or low constraint based on a defined rating scale. At various stages, for each set of facilities, the Los Vaqueros Reservoir Expansion Project team met after completing the evaluation matrices and profiles to review the results. The relative advantages and disadvantages of each facility site or pipeline route alternative were discussed and recommendations made for further analysis.

In September 2006, upon further refinement of the operations modeling, preliminary engineering and cost estimates, it was determined that 275 TAF was the maximum reservoir size to be evaluated. Subsequently, facilities sizing and siting were refined to accommodate a smaller reservoir expansion project; however much of the analysis conducted in the *Facilities Siting Report* (ESA, 2007) remained relevant, and new recommendations to accommodate the smaller project were made. These recommendations included the following:

- New Delta Intake and Pump Station to be located along the western bank of Old River, about 1,000 feet south of the existing pump station or expansion of the existing Old River Pump Station and associated facilities could occur.
- Balancing Reservoir to be located at the existing Transfer Facility (rather than a new, separate site within the watershed, as previously proposed).
- Inlet-Outlet Pipeline to be located generally within the Kellogg Creek Valley; creek corridor including buffer zone to be avoided.
- Stockpile Area to be located at the northern end of the Kellogg Creek Valley, east of Walnut Boulevard in an upland field.
- Delta-Transfer and Transfer-LV Pipelines to be co-located with the existing Old River Pipeline and Transfer Pipeline easements, rather than in separate, new alignments.

- Transfer-Bethany Pipeline alignment to be located generally parallel to Vasco Road to the point where Armstrong Road turns south, following Armstrong Road to the terminus, heading southeast toward the Harvey O. Banks Pumping Plant and then westward to Bethany Reservoir; alignment adjusted to avoid wetlands and sensitive plant areas.

Based on the facilities siting analysis, the best apparent alternatives were identified to advance to the next step of analysis. The facility siting process supported a systematic approach to establishing a reduced set of feasible alternatives for detailed EIS/EIR analysis, which are designed to avoid and minimize adverse effects while meeting project objectives.

More reconnaissance surveys that were required to fully analyze certain facilities where full access was not previously available as well as to define access roads, spoil disposal areas, pipeline staging areas, and power facilities were conducted in 2007–2008. Based on these surveys, the proposed site of the new Delta Intake and Pump Station was relocated farther south to avoid potential maintenance issues associated with the accumulation of sediments in the channel at the original site. Additionally, two route options for the last 1.5-mile segment of the Transfer-Bethany Pipeline were sited, both of which avoid impacts to vernal pool fairy shrimp (*Branchinecta lynchi*) complexes and burrowing owl (*Athene cunicularia*).

3.3 No Project/No Action Alternative

Both NEPA and CEQA require analysis of an alternative scenario in which the Proposed Project is not implemented. NEPA calls this the No Action Alternative while CEQA refers to it as the No Project Alternative. Reclamation recommends several criteria for including proposed future actions within the No Action Alternative. To be included in the No Project/No Action Alternative, future actions should be (1) authorized, (2) approved through completion of NEPA, CEQA, and Endangered Species Act compliance processes, (3) funded, and (4) permitted.

Under the No Project/No Action Alternative, CCWD and Reclamation would not implement the Los Vaqueros Reservoir Expansion Project. CCWD would continue to operate and maintain its existing facilities to deliver reliable water supply to its customers and maximize delivered water quality consistent with environmental regulations and permit conditions. In the near-term, there would be no substantive operational changes implemented under the No Project/No Action Alternative.

To maintain supply reliability to its customers over time, CCWD would continue to implement actions identified in its *Future Water Supply Study* (CCWD, 1998), including acquisition of water transfers as needed to provide reliable dry-year water supply. (See Chapter 2, Project Background, for a discussion of CCWD's existing facilities and operations and its future plans.) No new emergency storage would be provided to CCWD or its customers.

Bay Area water agencies receiving water from the Delta via the SWP or the CVP would continue to pursue actions to improve water supply reliability under separate environmental impact review, in accordance with CEQA and NEPA, as appropriate. No new emergency storage would be provided at Los Vaqueros Reservoir for Bay Area water agencies.

No new pipeline connection to Bethany Reservoir would be constructed. The approved enlargement of the SBA now in progress would be completed, but no other changes to the SBA conveyance system would be included.

The No Project/No Action Alternative includes the projects identified in the CALFED Storage Program Common Assumptions/Common Modeling Package. Key projects assumed to be in place and operating in the future include the Delta Mendota Canal–California Aqueduct Intertie, permanent operable barriers in the south Delta and the Freeport Regional Water Project. A full list of Common Assumptions projects is included in Appendix C. The No Project/No Action Alternative does not include new projects to implement ongoing planning efforts, including the Bay Delta Conservation Plan and the San Joaquin River Restoration Plan. DWR and Reclamation are beginning studies on potential modifications to the existing water conveyance system through the Delta, but no specific project(s) can yet be considered a part of the No Project/No Action Alternative because environmental review is not complete, no project has been approved, and the project(s) are not included in the Common Assumptions project list.

No Environmental Water Management supplies would be provided, and no water would be provided to South Bay water agencies through positive-barrier screened intakes. South Bay water agencies would not be able to eliminate diversions for 30 days in the spring and receive supplies from an expanded Los Vaqueros Reservoir instead. No additional wildlife refuge water supplies would be available from Los Vaqueros Reservoir. If Reclamation decided to pursue additional refuge supplies, Reclamation would have to pursue other means, such as water transfers, to provide them. If additional fishery protection measures were found to be desirable, they would have to be provided by means other than through an expanded Los Vaqueros Reservoir.

3.4 Action Alternatives

3.4.1 Overview

This Draft EIS/EIR presents an evaluation of the four action alternatives that include different combinations of facility and water delivery options for expanding Los Vaqueros Reservoir as well as associated water conveyance. As explained in Section 3.1.1, the facility options differ in the amount of reservoir storage capacity (i.e., increasing the Los Vaqueros Reservoir to either 275 TAF or 160 TAF) and whether a South Bay Connection is constructed linking the Los Vaqueros Reservoir system to South Bay water agencies via Bethany Reservoir and the SBA. The water delivery operations differ as to the emphasis placed on the two primary project objectives: environmental water management and water supply reliability. (See Chapter 1 for a discussion of project purpose, need and objectives.)

The evaluation of benefits described in this report is intended to provide information for potential project participants and to provide a basis for evaluating potential environmental impacts. If the lead agencies decide to pursue the project following this environmental analysis, additional analyses of the extent of these benefits will be necessary for potential project partners, including state and federal government agencies, to determine their level of interest and willingness to make a financial commitment to the Proposed Project.

Benefits referred to in this Draft EIS/EIR are not the same as benefits used to justify federal interest in a Federal Feasibility Report, rather benefits indicate that an effect is beneficial instead of detrimental to the environment.

Alternative 1 is considered the Proposed Project for purposes of CEQA and it is treated as the Proposed Action for purposes of NEPA. Alternative 1 includes the largest reservoir expansion and greatest extent of associated facilities considered in this Draft EIS/EIR and is designed to meet both of the primary project objectives. At the other end of the range, Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities. At this stage of planning and evaluation, none of the alternatives has been designated as the Preferred Alternative under NEPA or the Least Environmentally Damaging Practicable Alternative under Section 404(b)(1) of the federal Clean Water Act because related engineering, economic and financial feasibility analyses are not yet complete.

The project area location is the same for each of the four action alternatives. The Proposed Project is in southeastern Contra Costa County, California. A portion of the South Bay Connection would be constructed in Alameda County, California. **Figure 3-1** shows the project area location within the Bay Area region. **Figure 3-2** shows the project area location relative to CCWD's existing water system facilities and its service area.

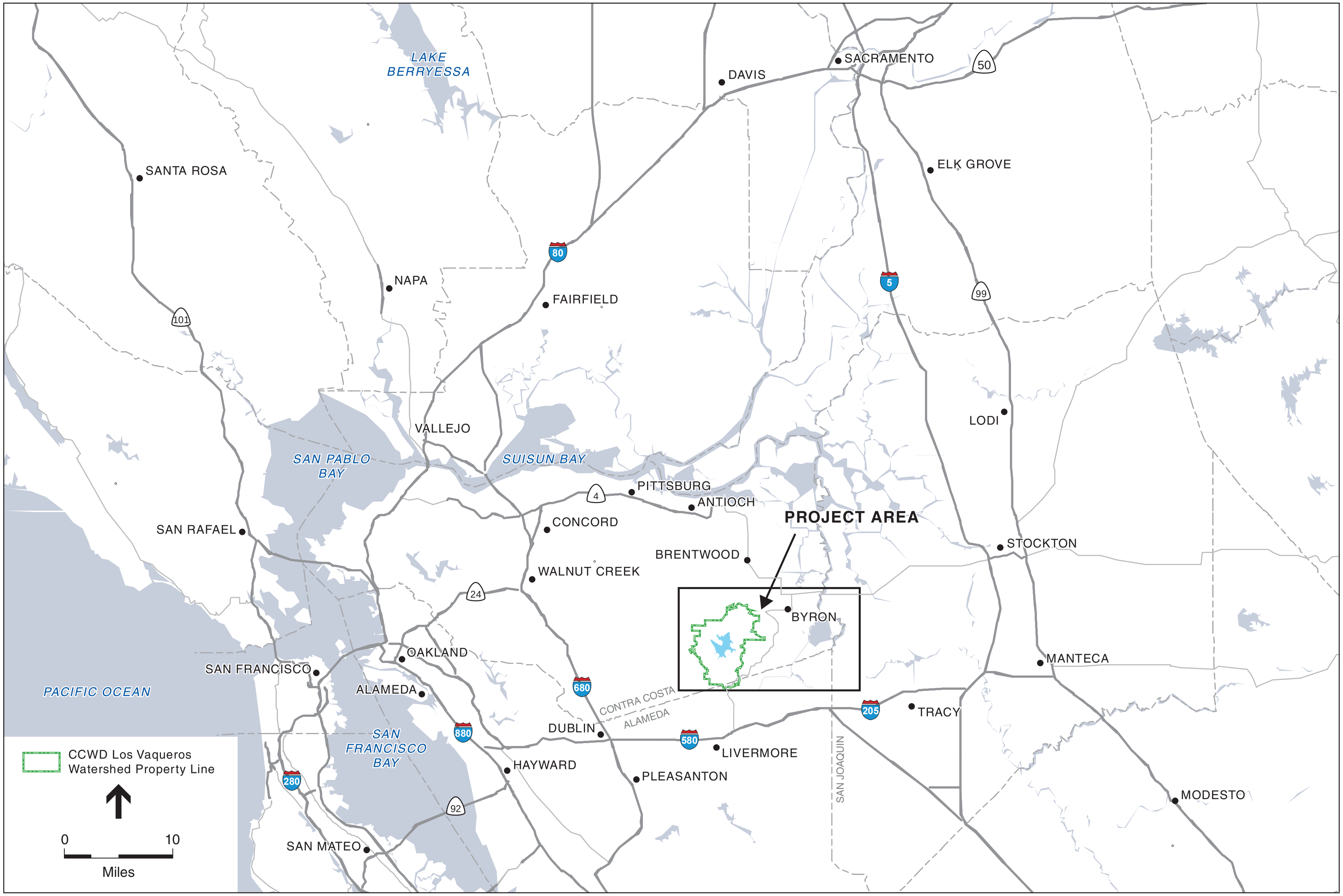
In addition to expansion of the Los Vaqueros Reservoir, each alternative would involve expansion of some of the other existing CCWD water system facilities along with construction of new facilities. **Figure 3-3** shows the project area in detail and highlights the existing water system facilities within the project area. The new and expanded facilities proposed under each of the four action alternatives would be integrated into the existing water system facilities shown on this figure.

See Section 2.1 for a description of CCWD's existing reservoir and related water system facilities. Existing facilities that would be integrated into the Los Vaqueros Reservoir Expansion Project are:

- Old River Intake and Pump Station — a 250 cubic feet per second (cfs) intake and pump station on Old River near State Route 4, equipped with a positive barrier fish screen that meets U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and California Department of Fish and Game (CDFG) screening criteria.

- Alternative Intake Project (AIP) — a 250-cfs intake and pump station on Victoria Canal, equipped with a positive barrier fish screen that meets USFWS, NMFS, and CDFG screening criteria. Water from the AIP is conveyed by pipeline to the Old River Pipeline at the Old River Pump Station; the AIP is currently under construction.

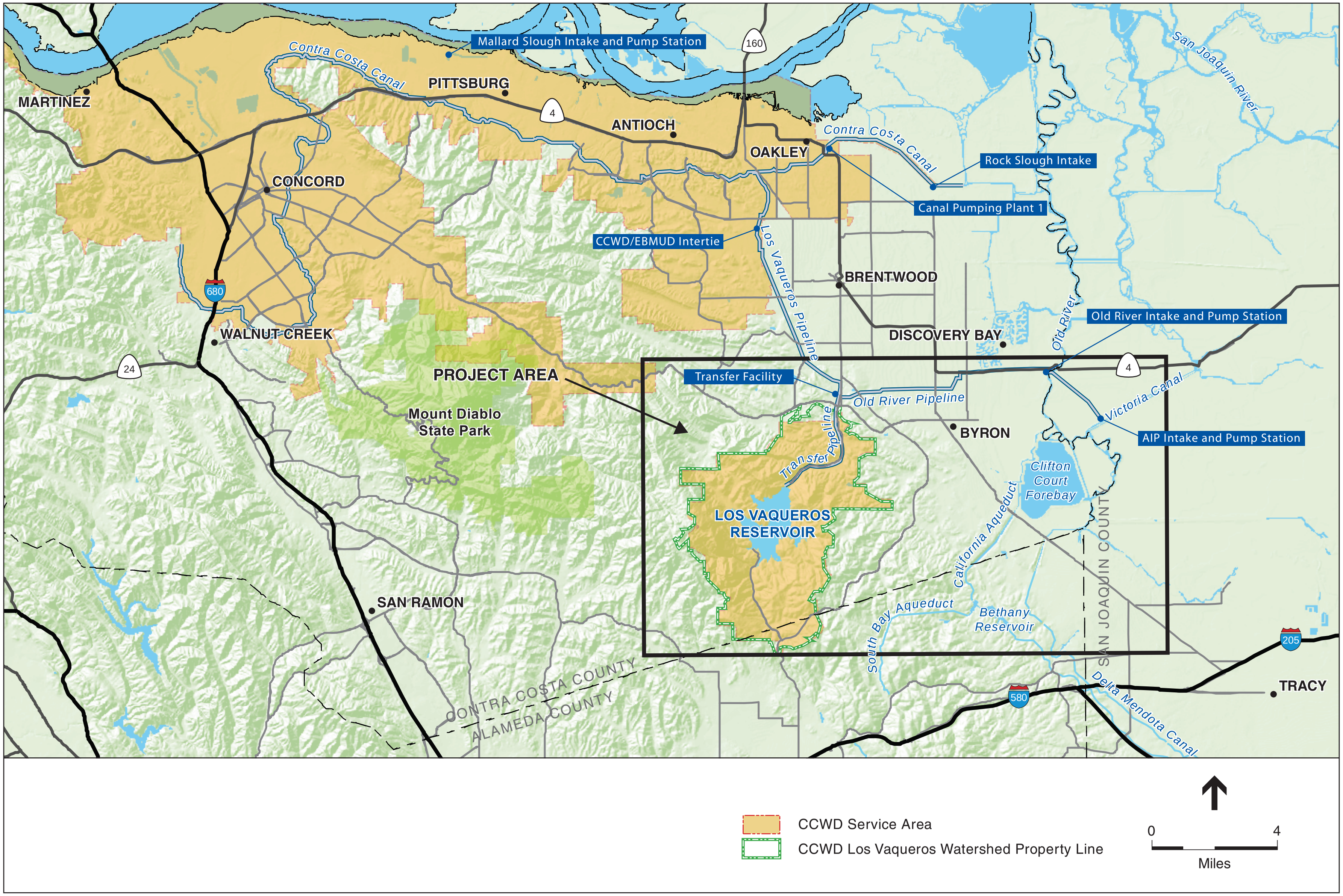
- Old River Pipeline — a 78-inch diameter, 320-cfs pipeline that conveys water from the Old River Pump Station to the Transfer Facility.



SOURCE: DeLorme Street Atlas USA, 2000; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

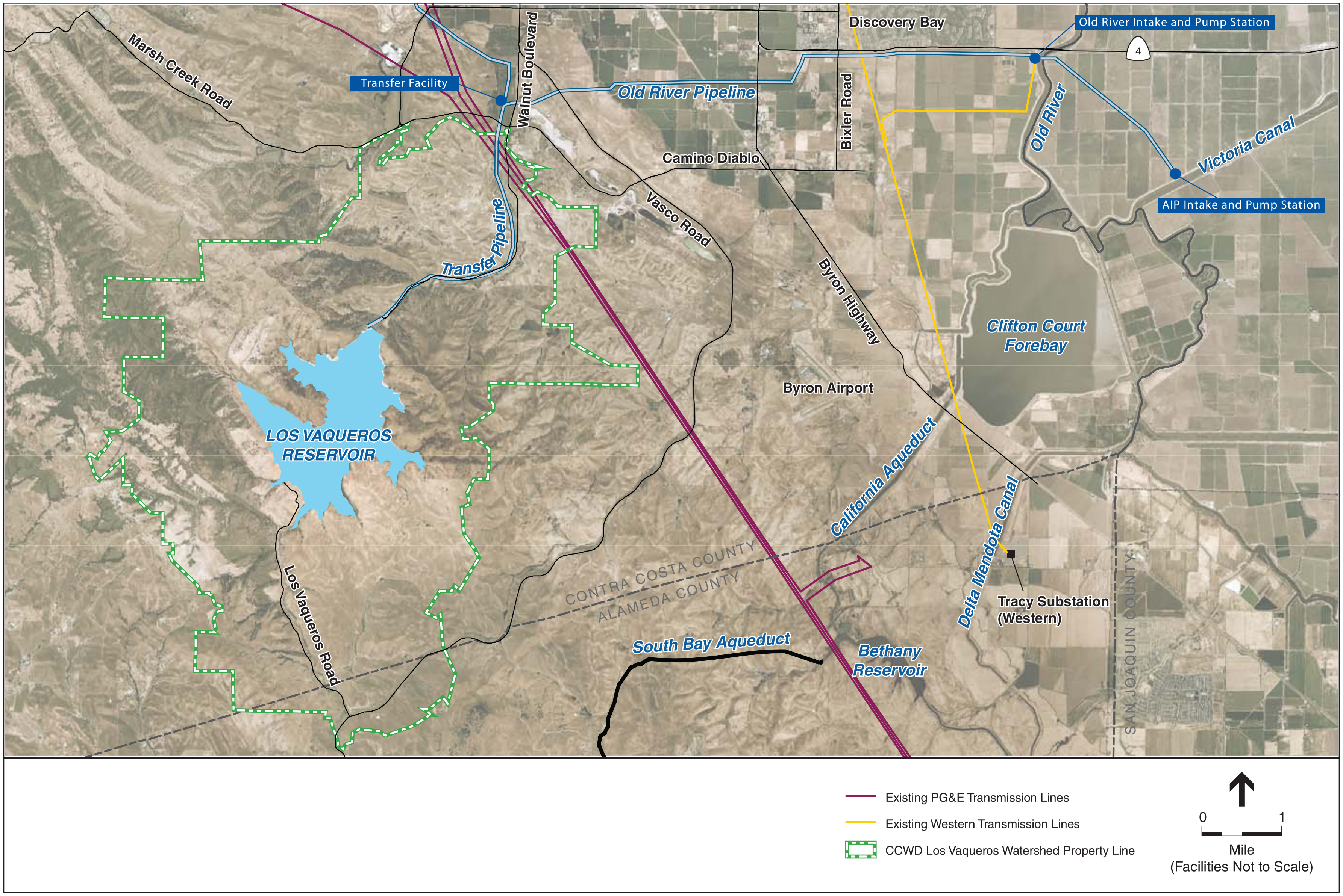
Figure 3-1
Regional Project Area Location



SOURCE: USGS, 1993 (base map); and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 3-2
Project Area Location Relative to CCWD Existing Water System Facilities



SOURCE: USGS, 1993 (base map); and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 3-3
CCWD Existing Facilities in the Project Area

- Transfer Facility — the Los Vaqueros Reservoir system hub that regulates water into and out of the Los Vaqueros Reservoir and to the Contra Costa Canal via the Los Vaqueros Pipeline; key facilities include a 4 million gallon (MG) steel tank, a pump station to lift water to the reservoir, and a flow control station.

- Transfer Pipeline — a 72-inch diameter pipeline that conveys water from the Transfer Facility to the Los Vaqueros Reservoir at 200 cfs and carries up to 400 cfs in releases from the Los Vaqueros Reservoir to the Transfer Facility.

- Los Vaqueros Dam and Reservoir — a 100-TAF offstream storage reservoir impounded behind a 190-foot-high earthfill embankment dam; the existing dam can be raised to 282 feet to impound up to 275 TAF.

Under all alternatives, certain features of CCWD's existing operations would be integrated into the Los Vaqueros Reservoir Expansion Project. These include:

- Reservoir filling would occur during periods of low salinity to ensure that the project will continue to meet CCWD's water quality goals.

- Water for direct deliveries to CCWD would be diverted under CCWD's CVP water supply contract or as transfers such as CCWD's long-term agreement with the East Contra Costa Irrigation District.

- Water stored in Los Vaqueros Reservoir for CCWD purposes would be diverted under CCWD's Los Vaqueros water right permit or under CCWD's CVP water supply contract.

- No water would be diverted through the Los Vaqueros intake system from the Delta during a 30-day No-Diversion Period in the spring. This would provide substantial fishery protection by avoiding diversions during the most fish-sensitive period. It is assumed that other Delta operational restrictions would not affect reservoir filling and direct deliveries outside of the No-Diversion Period. The analysis presented in Section 4.3 and Appendix C demonstrates that operations under this assumption, in conjunction with the use of positive-barrier fish screens and water quality limits on reservoir filling, would not cause adverse impacts.

Under all alternatives, existing recreational facilities within the Los Vaqueros Watershed that are disturbed or displaced by the reservoir expansion project would be relocated or replaced. For Alternatives 1, 2, and 3, additional electrical power supply would need to be extended to proposed project facilities from the existing Western Area Power Administration (Western) and/or Pacific Gas and Electric (PG&E) power utilities that serve existing CCWD facilities.

The four action alternatives are described in the following sections with respect to proposed facilities and operational emphasis. **Table 3-3** summarizes the existing and proposed facilities (expanded and new) including the key facility characteristics (size and capacity) for the four alternatives. Detailed information about the proposed facilities is provided in Section 3.5, including site location, layout, relevant facility design, operation, and maintenance.

TABLE 3-3
MAJOR FACILITY COMPONENTS OF ALTERNATIVES

Component	No Project / No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Reservoir Facilities					
Los Vaqueros Reservoir – Storage Capacity	100 TAF	275 TAF	275 TAF	275 TAF	160 TAF
Dam Raise	NA	Yes	Yes	Yes	Yes
Maximum Water Surface Elevation	**472 ft**	**560 ft**	**560 ft**	**560 ft**	**510 ft**
Intake Facilities					
Old River Intake and Pump Station (*existing facility; expanded under Alternative 3 only*)	250 cfs	250 cfs	250 cfs	320 cfs	250 cfs
Delta Intake and Pump Station (*new facility*)	NA	Up to 170 cfs	Up to 170 cfs	NA	NA
AIP (*existing facility*)	250 cfs	250 cfs	250 cfs	250 cfs	250 cfs
Conveyance Pipelines and Facilities					
Old River Pipeline (*existing facility*)	320 cfs	320 cfs	320 cfs	320 cfs	320 cfs
Delta-Transfer Pipeline (*new facility*)	NA	350 cfs	350 cfs	250 cfs	NA
Total conveyance capacity from the Delta	**320 cfs**	**670 cfs**	**670 cfs**	**570 cfs**	**320 cfs**
Transfer Facility (pumping / storage tank capacities) (*existing facility; upgraded under Alternatives 1-4; expanded under Alternatives 1 and 2*)	200 cfs /4 MG	670 cfs/12 MG	670 cfs/12 MG	570 cfs/12MG	200 cfs/4 MG
Transfer Pipeline (*existing facility*)	200 cfs to LV Res. and 400 cfs from LV Res. to CC Canal via LV Pipeline	400 cfs from LV Res. to CC Canal via LV Pipeline	400 cfs from LV Res. to CC Canal via LV Pipeline	400 cfs from LV Res. to CC Canal via LV Pipeline	200 cfs to LV Res. & 400 cfs from LV Res. to CC Canal via LV Pipeline
Transfer-LV Pipeline (*new facility*)	NA	670 cfs to LV Res. and 470 cfs from LV Res. to Bethany Res. via Transfer-Bethany Pipeline	670 cfs to LV Res. and 470 cfs from LV Res. to Bethany Res. via Transfer-Bethany Pipeline	570 cfs to LV Res.	NA
Transfer-Bethany Pipeline (*new facility*)	NA	470 cfs	470 cfs	NA	NA
Electrical Power Facilities (Two Options)					
Option 1: Extend new supply facilities from and upgrades to existing Western facilities *OR* Option 2: Extend new supply facilities from and upgrades to existing Western and PG&E facilities	NA	Needed	Needed	Needed	NA

cfs = cubic feet per second; CC = Contra Costa; ft = feet; LV Res = Los Vaqueros Reservoir; MG = million gallons; NA = not applicable; PG&E = Pacific Gas & Electric; TAF = thousand acre-feet

3.4.2 Alternative 1: Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management and Water Supply Reliability Dual Emphasis

Alternative 1 is the largest reservoir expansion considered of the four action alternatives, has the greatest extent of associated facilities, and would be operated to meet both of the primary project objectives. Under this alternative, the reservoir would be expanded from the existing storage capacity of 100 TAF to 275 TAF. A new Delta Intake and Pump Station as well as new conveyance facilities to move water from the Delta to the Los Vaqueros Reservoir would be constructed. The South Bay Connection would be constructed linking the Los Vaqueros Reservoir system to South Bay water agencies via Bethany Reservoir and the SBA. New power facilities would be constructed to serve the new intake and other expanded Los Vaqueros Reservoir system facilities. Recreational facilities affected by the increased inundation area would be relocated or replaced.

Proposed Facilities

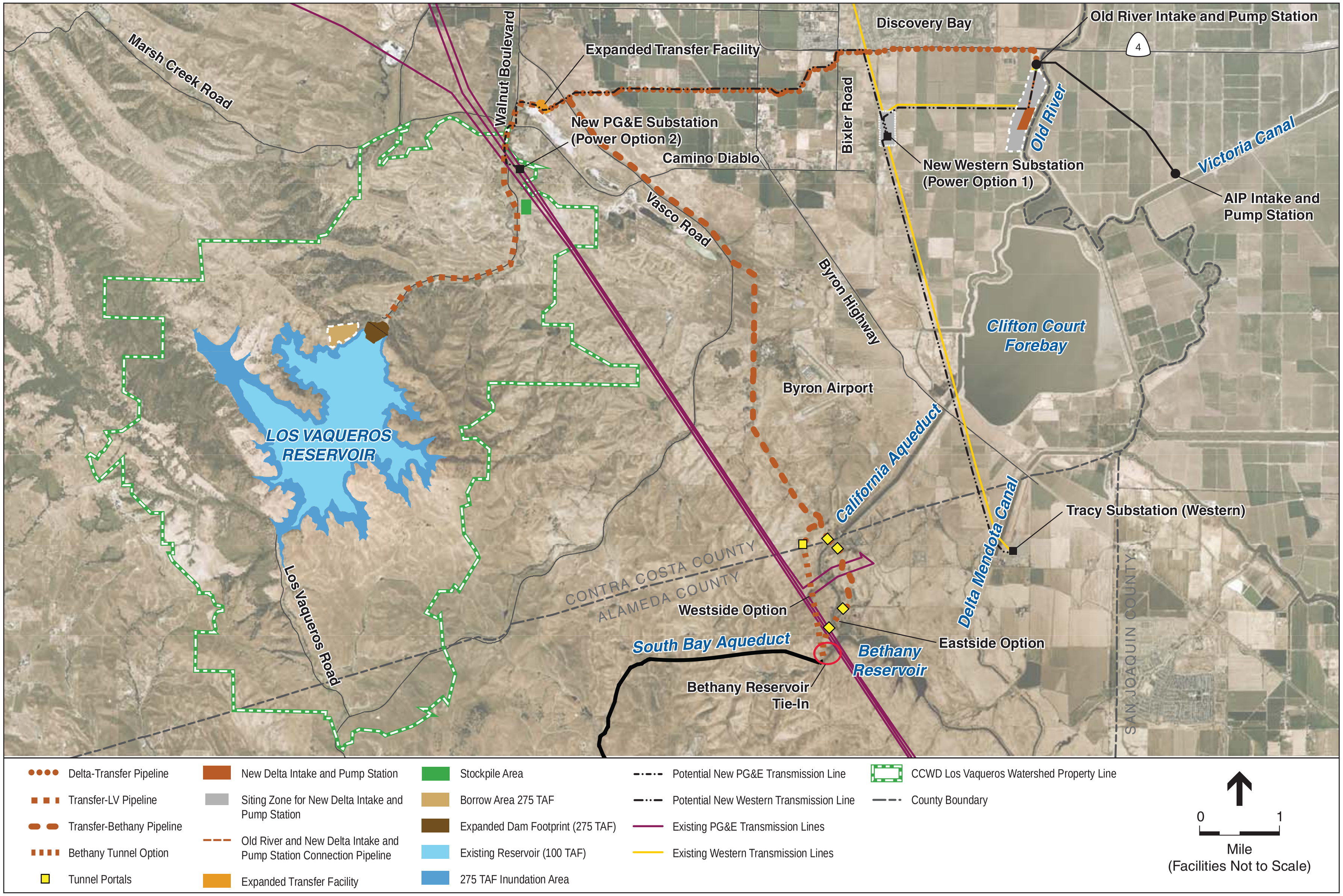
Figure 3-4 shows the facilities proposed under Alternative 1 and Table 3-3 summarizes the proposed facilities and their capacities. Under this alternative, the Los Vaqueros Reservoir would be expanded from the existing storage capacity of 100 TAF to 275 TAF. This would involve raising the existing dam, essentially building over the existing dam facility to raise and strengthen it to support the larger reservoir. **Figure 3-5** shows the reservoir inundation area for the 275-TAF reservoir compared to the Los Vaqueros Reservoir. The reservoir water surface area would increase from about 1,500 acres to about 2,500 acres.

Total diversion capacity under this alternative would be up to 670 cfs. Of this total diversion capacity, 500 cfs would come from the existing Old River Intake and Pump Station (250 cfs) and AIP (250 cfs), and the remaining capacity would come from a new 170-cfs Delta Intake and Pump Station. Under Alternative 1, the existing operating permits would be modified to allow combined diversions from all three intakes of the full 670 cfs capacity. This would not allow more water to be diverted from the Delta than would be allowed under existing water right permits, but it would change the location from where the water is diverted and some of the restrictions on the Los Vaqueros system intakes.

The new Delta Intake and Pump Station would be constructed along the Old River channel south of the existing intake structure on an approximately 22-acre parcel within the siting zone shown on Figure 3-4. Additional engineering and geotechnical investigations are required to select the final site location.

The capacity of the existing conveyance facilities that move water from the Delta to the Los Vaqueros Reservoir would also be expanded by the following means:

- Installing an additional pipeline parallel to the existing pipeline that extends from the Delta to the Transfer Facility and then from the Transfer Facility to the reservoir; and
- Adding expanded facilities at the existing Transfer Facility site (which currently includes a pump station, surge tanks, regulating reservoir and flow control station).



SOURCE: USGS, 1993 (base map); and ESA, 2008

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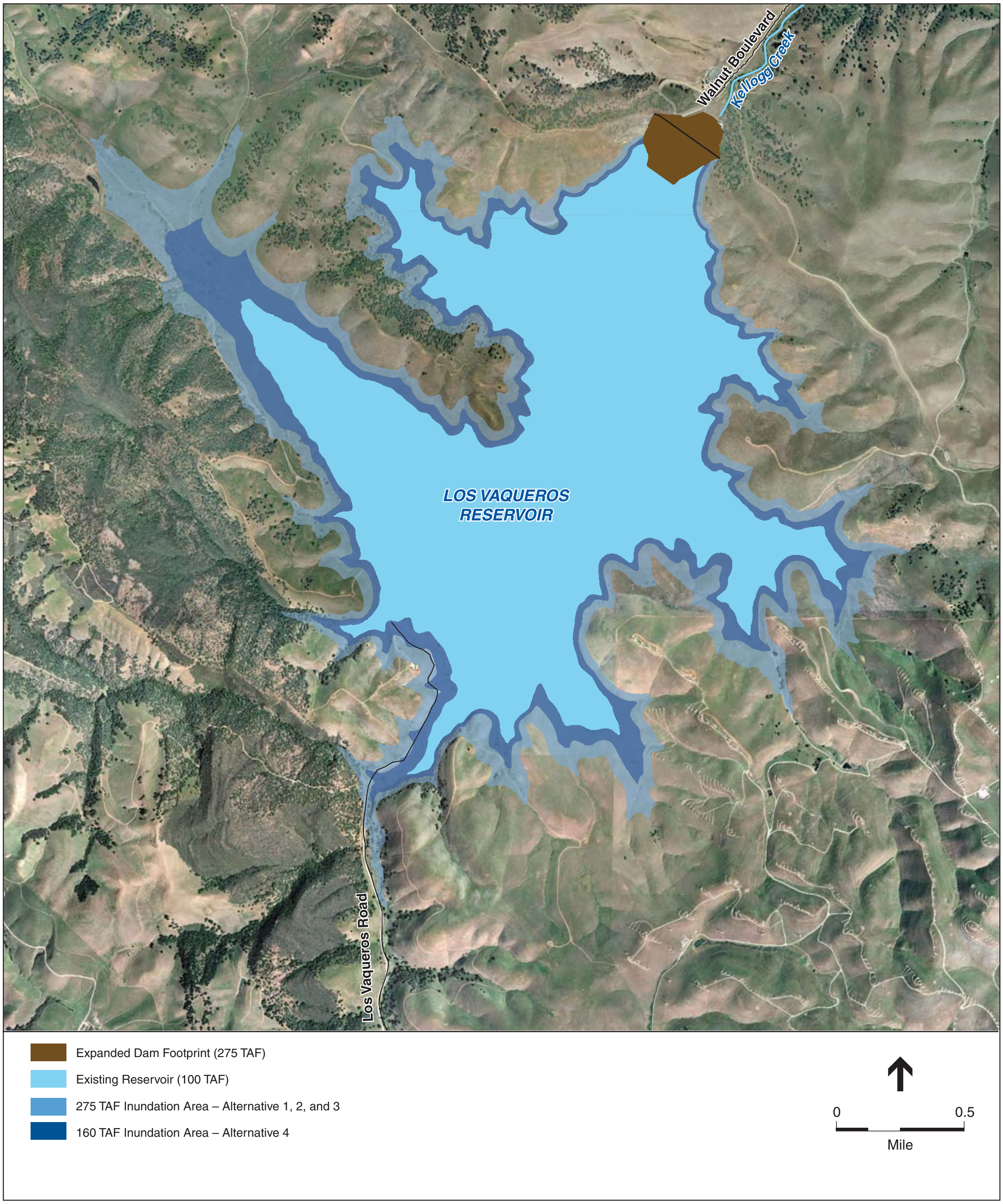
Figure 3-4
Proposed Facilities – Alternatives 1 and 2



SOURCE: GlobeXplorer, 2007; and ESA, 2008

Figure 3-5
Reservoir Expansion – Inundation Area

The proposed new Delta-Transfer Pipeline would have a capacity of up to 350 cfs and would be installed generally parallel to the existing Old River Pipeline between the intake facilities and the Transfer Facility. With the addition of the second pipeline, total conveyance capacity between the Delta intake facilities and the Transfer Facility would be up to 670 cfs. Similarly, an adjoining pipeline, referred to as the Transfer-LV Pipeline, would be installed parallel to the existing Transfer Pipeline between the Transfer Facility and the Los Vaqueros Reservoir. The Transfer-LV Pipeline would be used to fill the expanded reservoir at a rate of up to 670 cfs and to release water from the Los Vaqueros Reservoir to Bethany Reservoir via the Transfer-Bethany Pipeline (described below) at a rate of up to 470 cfs. The existing Transfer Pipeline would be used to convey release flows to the Contra Costa Canal via the Los Vaqueros Pipeline at up to 400 cfs.

The existing Transfer Facility would be expanded to accommodate movement of the higher flow volumes into and out of the expanded reservoir, and into the Transfer-Bethany Pipeline. As shown on Table 3-3, with the proposed expansion of the Transfer Facility, the total pumping capacity would be 670 cfs and Transfer Facility storage capacity would be 12 MG. The additional facilities would be next to the existing facilities at this site. In addition, an energy recovery system would be installed at the Transfer Facility to capture the hydraulic energy generated by the water delivered by gravity from the reservoir to the Transfer-Bethany Pipeline.

A key component of this alternative is the South Bay Connection, which consists of the Transfer-Bethany pipeline and appurtenant facilities extending between the Transfer Facility and Bethany Reservoir. The point of delivery would be near the South Bay Pumping Plant. From the point of delivery, the water would either be pumped into the SBA for use by the South Bay water agencies or moved to San Luis Reservoir for use by SCVWD as federal CVP water supply. No new or modified facilities are needed to move water beyond the point of delivery. The new Transfer-Bethany Pipeline would have a capacity of up to 470 cfs; the final capacity requirements will be determined during project design.

Additional and/or new power supplies would be required at the new Delta Intake and Pump Station and Expanded Transfer Facility. Power could be supplied via either of two options: Power Option 1: Western Only would extend new supply facilities from and construct upgrades to existing Western facilities; or Power Option 2: Western & PG&E would extend new supply facilities from and construct upgrades to existing Western and PG&E facilities. The power options are described in detail in Section 3.5.4.

Existing recreational facilities within the Los Vaqueros Watershed that are disturbed or displaced by the reservoir expansion would be relocated or replaced. Alternative 1 also includes construction of additional recreational facilities as described in detail in Section 3.5.5.

Operations

The water system operations that were assumed for this alternative were designed with a dual emphasis on both primary objectives, using an expanded Los Vaqueros Reservoir to improve Environmental Water Management and increase Water Supply Reliability for the Bay Area. Operations were adjusted through an iterative analytical process (described in Appendix C) to meet the project objectives while minimizing impacts and avoiding harm to other water users. Alternative 1 would also meet the secondary objective of water quality improvement. Environmental Water Management, Water Supply Reliability, and Water Quality benefits are quantified and presented in Section 4.2, Delta Hydrology and Water Quality. This alternative assumes 20 TAF of the expansion is reserved for CCWD.

Operations would be coordinated with SWP and CVP operations as generally described in Section 3.1.2, Water Rights and Coordinated Operations. It is anticipated that water for South Bay water agency use would be diverted under existing CVP and SWP water right permits, modified as needed.

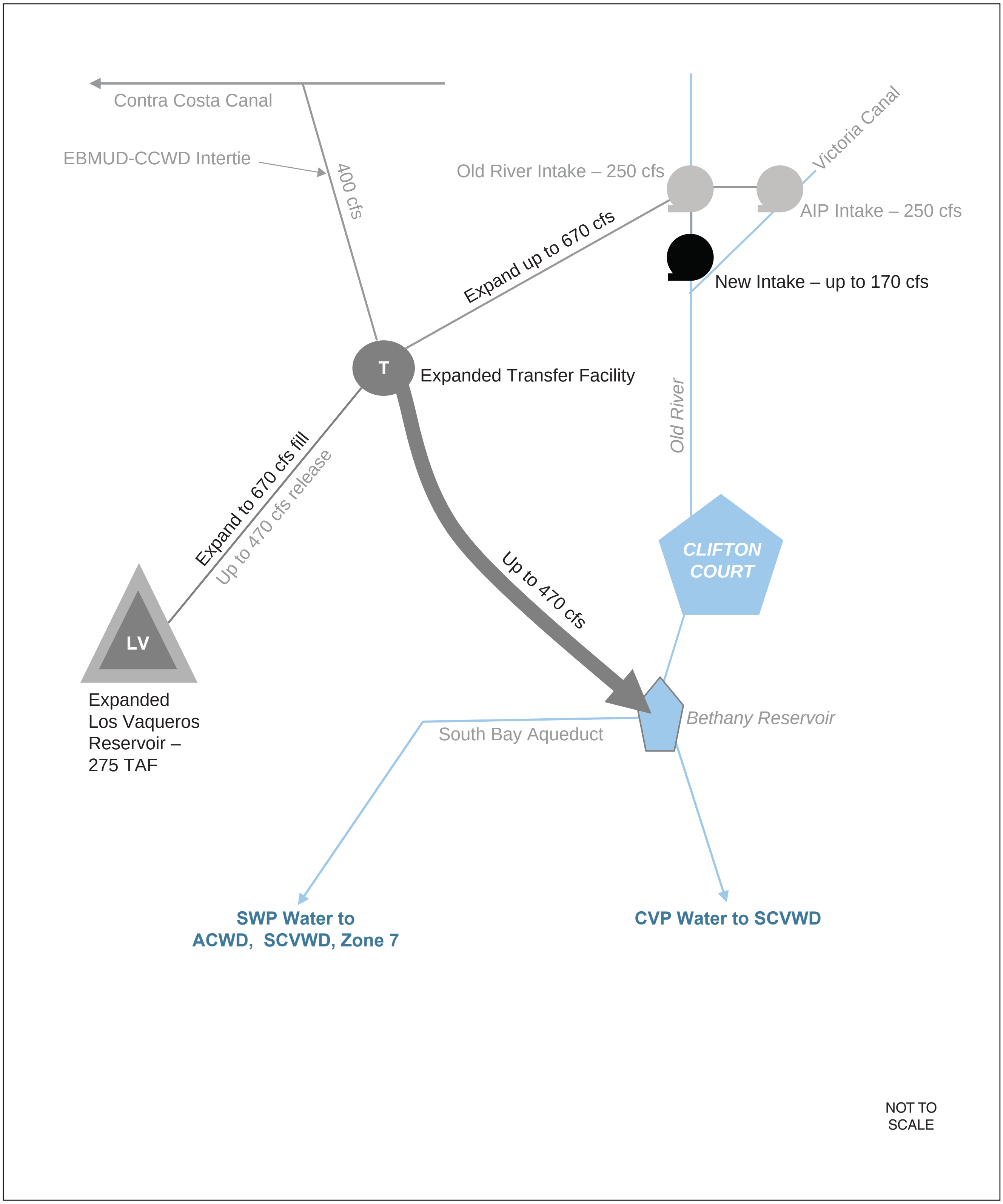
Figure 3-6 is a schematic that shows how water would be delivered under Alternative 1.

Environmental Water Management

Under Alternative 1, operations to improve Environmental Water Management would include Improved Fish Screening, the No-Diversion Period, and Multiple Delta Intake Locations.

With **Improved Fish Screening**, a major portion of the contracted SWP and CVP water delivered to the South Bay water agencies would be provided through the expanded Los Vaqueros Reservoir system, using state-of-the-art, positive-barrier fish screens, which protect fish more effectively than the existing CVP and SWP Delta export pumping systems. CVP and SWP Delta pumping would be reduced to correspond with the use of the Los Vaqueros Reservoir pumping system for these agencies. In the modeling used in this Draft EIS/EIR to simulate Delta water conditions and fish impacts, this reduction was assumed to take place at the same time as the shift to Los Vaqueros Reservoir system intakes, but the timing of the reduction could be adaptively managed to increase benefits for fish. For example, if reductions in SWP and CVP Delta export pumping were consolidated, the export pumps could be operated at minimal levels for a period of time in April to improve salmon migration or to allow delta smelt larvae to move out of the south Delta, or they could be operated at minimal levels for a period of time in February to allow longfin smelt (*Spirinchus thaleichthys*) larvae to move out of the south Delta. Whether or not timing of reductions is shifted to further increase benefits for fish, this alternative is expected to further the Environmental Water Management objective by reducing the mortality of Delta fish associated with the current salvage operation at the CVP and SWP Delta pumps. Improved fish screening would result in a long-term annual average of about 205 TAF per year of water managed for environmental improvement under Alternative 1, assuming moderate fishery restrictions.

With the **No-Diversion Period**, a portion of the additional storage capacity in an expanded Los Vaqueros Reservoir would be used to replace Delta pumping for the South Bay water agencies and CCWD for 30 days during the most critical fish period in the spring, furthering Environmental Water Management objectives. The timing of the No-Diversion Period would be adaptively managed to create the most benefit for fish.



SOURCE: CCWD, 2008; and ESA, 2008

Figure 3-6
Alternative 1 Schematic –
275 TAF Reservoir with South Bay Connection

Additional fish protection would result from implementation of Alternative 1 because of the availability of **Multiple Delta Intake Locations**. Under Alternative 1, a new Delta Intake and Pump Station would be constructed and could be adaptively managed with the existing Old River Intake and Pump Station and the intake on Victoria Canal currently under construction (AIP) to adjust pumping locations to reduce impacts on fish. Coupled with the additional storage capacity of Alternative 1, Multiple Delta Intake Locations would enable coordination with CVP and SWP operations and pumping facilities to improve flexibility to respond to changing fishery conditions in the Delta.

Water Supply Reliability

Under Alternative 1, operations to increase Water Supply Reliability would include Delta Supply Restoration, Dry-Year Storage, and Emergency Storage.

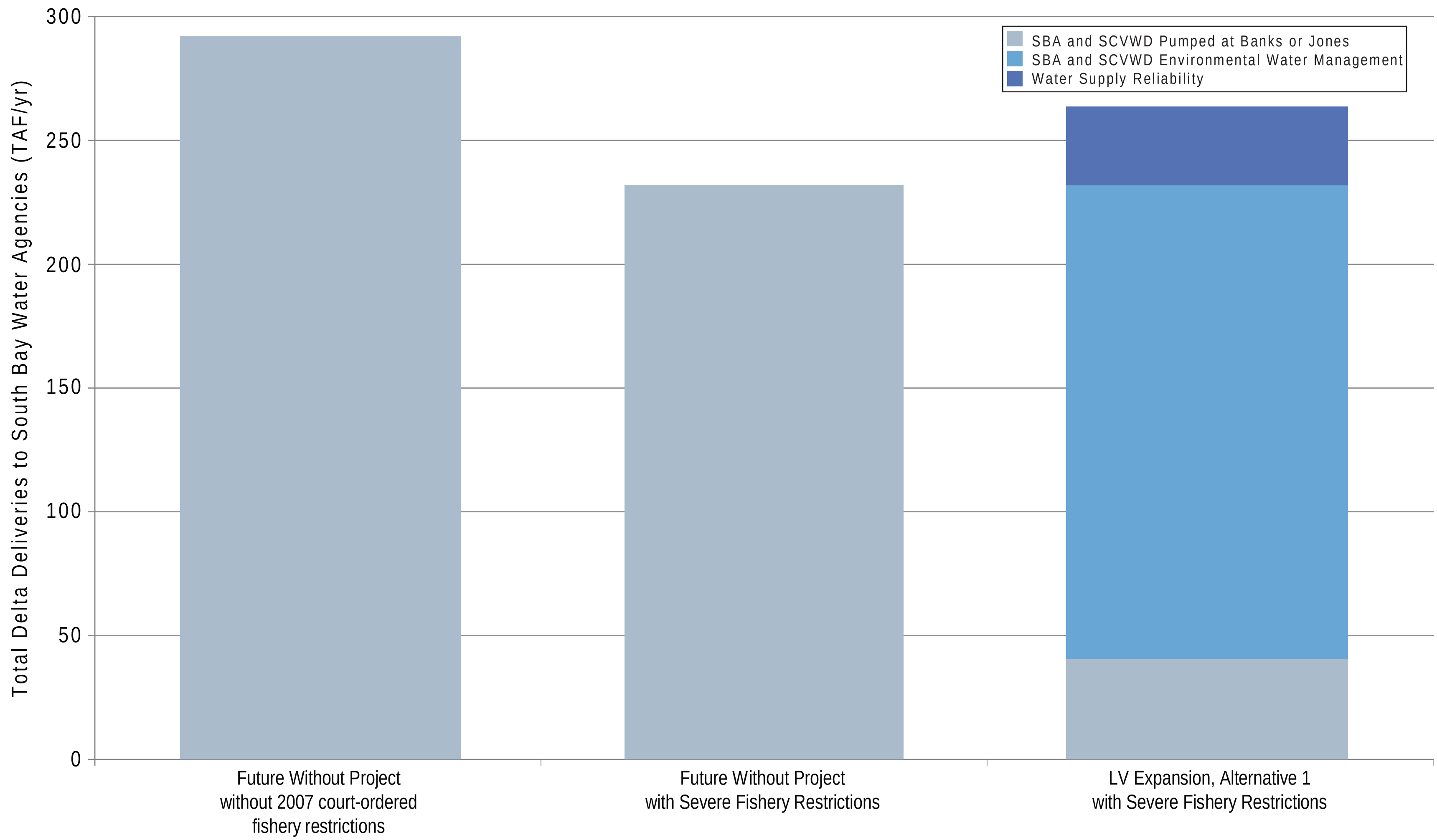
With **Delta Supply Restoration**, direct diversions and stored water supplies would be used to partially restore delivery reductions to the South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the SWP and CVP Delta export pumps. **Figure 3-7** illustrates this relationship. This analysis is further discussed in Section 4.2.

In addition, the Improved Fish Screening previously described could increase reliability for the South Bay water agencies by making the deliveries less subject to the short-term interruptions associated with regulatory restrictions on the SWP and CVP Delta export pumps. This type of interruption is not captured in the analysis performed for this Draft EIS/EIR but has been experienced at the SWP and CVP export pumps in recent years. These regulatory restrictions are not expected to apply to the Los Vaqueros Reservoir system diversions because of their effective screens.

Operating the expanded Los Vaqueros Reservoir for **Dry-Year Storage** would increase the amount of water available in dry years to South Bay water agencies and CCWD, reducing the need to purchase supplemental dry-year supplies, activate dry-year exchange programs or institute drought management measures. The amount of Dry-Year Storage available to the South Bay water agencies is integrated with the supply available for Delta Supply Restoration and is not quantified separately.

Assuming moderate fishery restrictions, Delta Supply Restoration and Dry-Year Storage would provide a long-term annual average benefit of 20 TAF for the South Bay water agencies. This annual average reliability benefit is 30 TAF in a 6-year drought. Figure 3-7 shows reliability benefits to the South Bay water agencies from Alternative 1, assuming severe fishery restrictions. Operating Alternative 1 for Dry-Year Storage would increase the amount of good quality water available to CCWD from Los Vaqueros Reservoir in dry years by up to 20 TAF at the start of a drought.

Emergency Storage available to the Bay Area region under Alternative 1 is about 225 TAF. This stored water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through either the South Bay Connection or existing interties between water agencies.



SOURCE: CCWD, 2008

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Figure 3-7
Water Supply Reliability
(2030 Level of Development)

Water Quality

This alternative is also expected to result in minor improvements in the quality of water delivered to South Bay water agencies by providing higher quality water from the reservoir instead of the Delta during dry periods and reducing deliveries of water through Clifton Court Forebay where warm, shallow, slow-moving water often results in algae growth and a resulting increase in organic carbon content and taste and odor issues. Additional storage would also provide water quality improvements for CCWD in dry years by increasing the amount of water available for blending.

3.4.3 Alternative 2: Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management Emphasis

Proposed Facilities

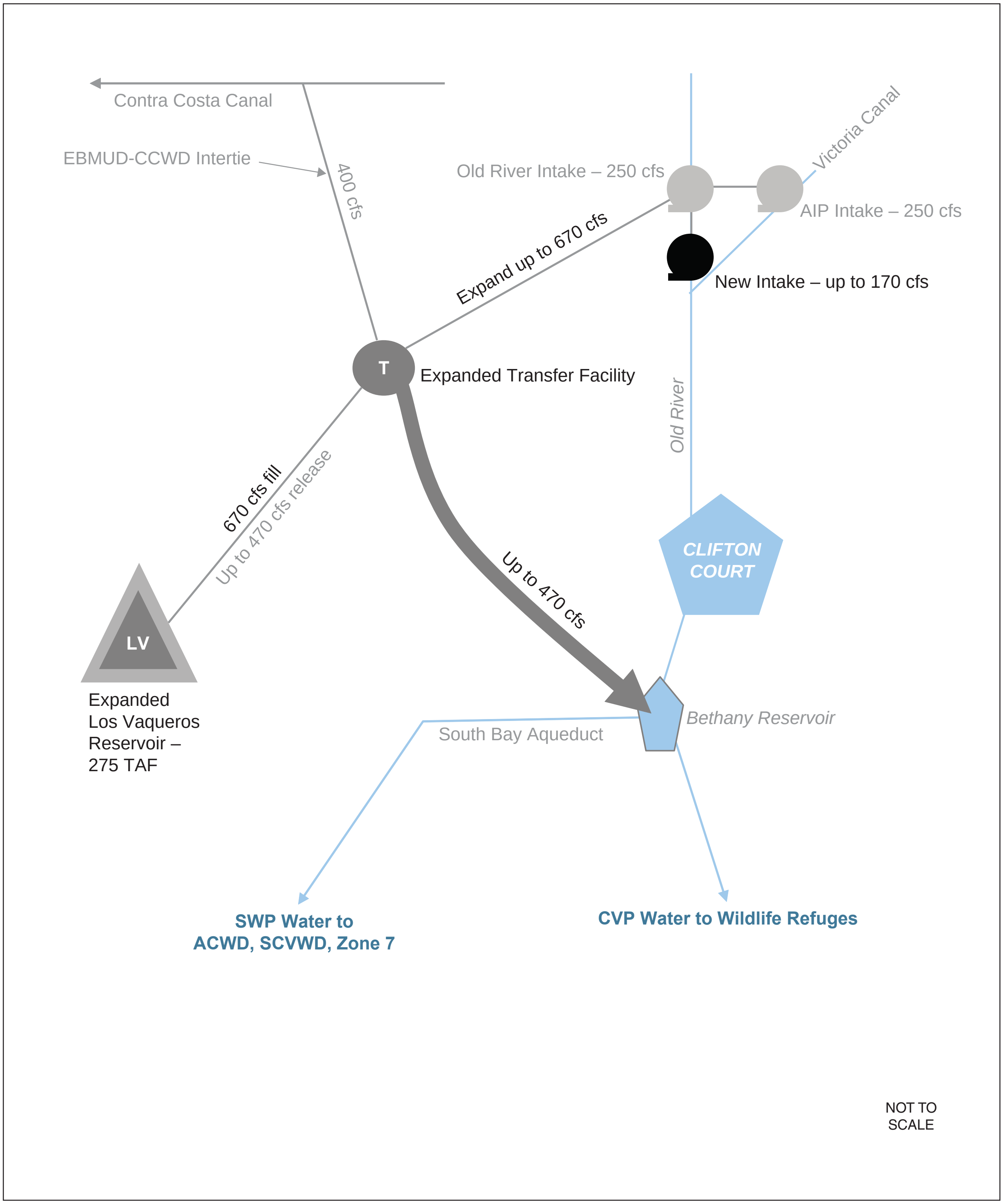
Under Alternative 2, new and expanded facilities to increase the storage capacity of Los Vaqueros Reservoir and connect to the South Bay water agencies would be the same as those described for Alternative 1. Alternative 2 is distinct from Alternative 1 in the water system operations evaluated. Figure 3-4 shows the facilities proposed under Alternative 2, and Table 3-3 summarizes the proposed facilities and their capacities. Figure 3-5 illustrates the 275-TAF reservoir inundation area compared with the Los Vaqueros Reservoir. Power options under Alternative 2 would be the same as those for Alternative 1. Recreational facilities under Alternative 2 would also be the same as those for Alternative 1.

Operations

The water system operations assumed for this alternative were designed to identify the impacts and benefits associated with using an expanded Los Vaqueros Reservoir system primarily to improve Environmental Water Management. This alternative results in some increases in Water Supply Reliability, but not to the same extent as Alternative 1. Operations were adjusted through an iterative analytical process (described in Appendix C) to meet the project objectives while minimizing impacts and avoiding harm to other water users. Alternative 2 also meets the secondary objective of water quality improvement. Environmental Water Management, Water Supply Reliability, and Water Quality benefits are quantified and presented in Section 4.2. This alternative assumes 20 TAF of the expansion is reserved for CCWD.

Operations would be coordinated with SWP and CVP operations as generally described in Section 3.1.2, Water Rights and Coordinated Operations. It is anticipated that water for South Bay water agencies use and dedicated storage for environmental water would be diverted under existing CVP and SWP water right permits, which would be modified as needed.

Figure 3-8 is a schematic that shows how water would be delivered under Alternative 2.



SOURCE: CCWD, 2008; and ESA, 2008

Figure 3-8
Alternative 2 Schematic –
275 TAF Reservoir with South Bay Connection

Environmental Water Management

Under Alternative 2, operations to improve Environmental Water Management would include Improved Fish Screening, No-Diversion Period, Multiple Delta Intake Locations and Dedicated Storage for Environmental Water. The effects and benefits of the first three operations are the same for Alternative 2 as for Alternative 1.

With **Dedicated Storage for Environmental Water**, capacity in the new and enlarged storage and conveyance facilities would be used to provide environmental water supplies for Delta fishery protection, San Joaquin Valley refuges, instream flows or other environmental purposes. For example, water from the expanded Los Vaqueros Reservoir system could be transferred to San Luis Reservoir where it would be available for delivery to Central Valley wildlife refuges, increasing the quantity of water available to these habitat areas. The stored environmental water could also be used to reduce Delta diversions during fish-sensitive periods, to reduce direct take at other diversion points, or to provide flows in rivers for fishery purposes. These benefits would be realized by drawing from the reservoir to provide water supplies to CCWD and the South Bay water agencies to increase flexibility for Reclamation and DWR to manage cold water storage in upstream dams, dam releases, and Delta diversions for fisheries benefits.

Together, the Improved Fish Screening and Dedicated Storage for Environmental Water would result in a long-term annual average of about 245 TAF of water managed for environmental improvement, assuming moderate fishery restrictions.

Water Supply Reliability

Under Alternative 2, operations to increase Water Supply Reliability would include Dry-Year Storage and Emergency Storage. In addition, as in Alternative 1, the Improved Fish Screening described above could increase reliability for the South Bay water agencies by making the deliveries less subject to the short-term interruptions associated with regulatory restrictions on the SWP and CVP Delta export pumps.

Operating Alternative 2 for **Dry-Year Storage** would increase the amount of good quality water available to CCWD from Los Vaqueros Reservoir in dry years by up to 20 TAF at the start of a drought.

Emergency Storage available to the Bay Area region under Alternative 2 is about 215 TAF. This water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through either the South Bay Connection or the existing interties between water agencies.

Water Quality

Alternative 2 is also expected to result in minor improvements in the quality of water delivered to South Bay water agencies by providing higher quality water from the reservoir instead of the Delta during dry periods and by no longer delivering water through Clifton Court Forebay where warm, shallow, slow-moving water often results in algae growth and a resulting increase in organic carbon content and taste and odor issues. Additional storage would also provide water quality improvements for CCWD in dry years by increasing the amount of water available for blending.

3.4.4 Alternative 3: Expanded 275-TAF Reservoir, No South Bay Connection, Environmental Water Management Emphasis

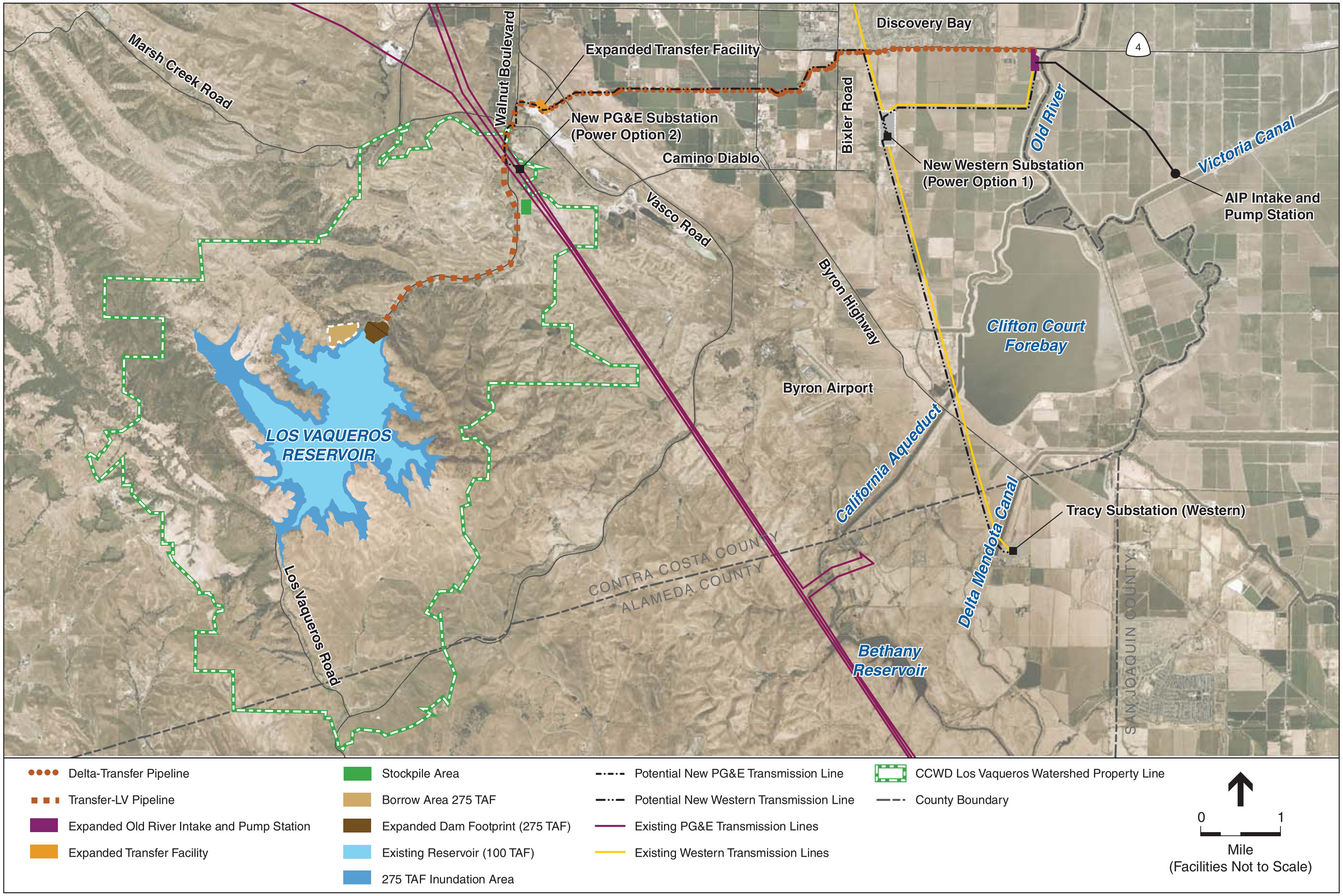
Proposed Facilities

Figure 3-9 shows the proposed facilities under Alternative 3. Under this alternative, new and expanded facilities to increase the storage capacity of Los Vaqueros Reservoir would include a 275-TAF reservoir as in Alternatives 1 and 2 and expanded diversion and filling capacity but would not include the South Bay Connection or a new Delta Intake and Pump Station. This alternative represents a “reduced facility” scenario relative to Alternatives 1 and 2. It allows for an evaluation of the environmental impacts of reduced facilities and the extent to which an expanded Los Vaqueros Reservoir could be operated to partially meet the project objectives without connecting to the South Bay water agencies. Figure 3-5 illustrates the 275-TAF reservoir inundation area compared with the Los Vaqueros Reservoir.

Without the South Bay Connection, other project components under Alternative 3 would be fewer and smaller than under Alternatives 1 and 2 because diversion rates would be lower. A new Delta intake would not be required. The Old River Intake and Pump Station would be expanded by replacing the existing pumps with higher capacity pumps and installing additional fish screens within existing vacant bays. All expansion work would be conducted within the existing facility site and would not require work within Old River. Total diversion capacity for Alternative 3 would be 570 cfs, with the AIP providing 250 cfs and an Expanded Old River Intake and Pump Station providing 320 cfs. Under Alternative 3, the intake operating permits would be modified to allow combined diversions of 570 cfs. This would not allow more water to be diverted from the Delta than would be allowed under existing water right permits, but it would change the location where the water is diverted and some of the restrictions on the Los Vaqueros system intakes.

Under Alternative 3, a new pipeline would be installed parallel to the existing pipeline between the Old River Intake and Pump Station and the Transfer Facility to increase conveyance capacity. The new pipeline capacity of 250 cfs would be smaller than the 350-cfs pipeline in Alternatives 1 and 2. In addition, a new pipeline would be installed parallel to the existing pipeline between the Transfer Facility and the Los Vaqueros Reservoir to provide 570 cfs of conveyance capacity to fill the expanded reservoir. The existing Transfer Pipeline would be used to convey release flows to the Contra Costa Canal via the Los Vaqueros Pipeline at up to 400 cfs.

Additional power supplies would be required at the Expanded Old River Intake and Pump Station and Expanded Transfer Facility. Power could be supplied via either of two options: Power Option 1: Western Only would extend new supply facilities from and construct upgrades to existing Western facilities; Power Option 2: Western & PG&E would extend new supply facilities from and construct upgrades to existing Western and PG&E facilities. The power options are described in detail in Section 3.5.4.



SOURCE: USGS, 1993 (base map); and ESA, 2008

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Figure 3-9
Proposed Facilities – Alternative 3

Existing recreational facilities within the Los Vaqueros Watershed that are disturbed or displaced by the reservoir expansion would be relocated or replaced. Alternative 3 also includes construction of additional recreational facilities as described in detail in Section 3.5.5.

Operations

The water system operations assumed for this alternative were designed to evaluate whether it would be possible to achieve the project objectives without constructing the South Bay Connection or the new Delta Intake and Pump Station. Because Alternative 3 does not include the South Bay Connection, CVP and SWP supplies would not be delivered to the South Bay water agencies through the expanded Los Vaqueros Reservoir system, and the potential fisheries and reliability benefits associated with Improved Fish Screening would not be achieved. This alternative also would not provide increased water supply reliability for these agencies.

Alternative 3 water system operations emphasize the use of an expanded Los Vaqueros Reservoir to improve Environmental Water Management. Operations were adjusted through an iterative analytical process (described in Appendix C) to meet the project objectives while minimizing impacts and avoiding harm to other water users. Alternative 3 would also meet the secondary objective of water quality improvement. Environmental Water Management, Water Supply Reliability, and Water Quality benefits are quantified and presented in Section 4.2. This alternative assumes 20 TAF of the expansion is reserved for CCWD.

Operations would be coordinated with SWP and CVP operations as generally described in Section 3.1.2, Water Rights and Coordinated Operations. It is anticipated that water for dedicated storage for environmental water would be diverted under existing CVP water right permits, modified as needed.

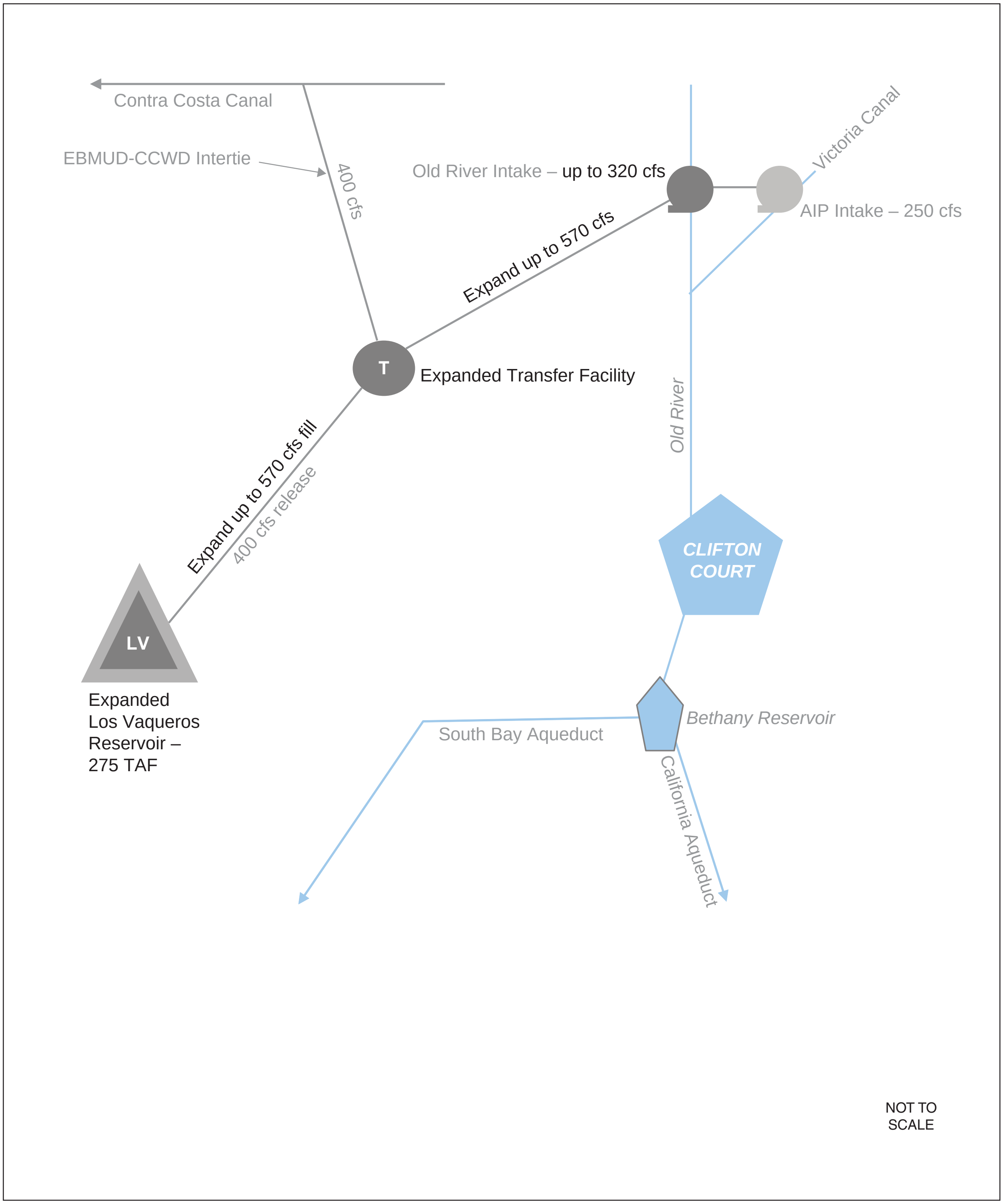
Figure 3-10 is a schematic that shows how water would be delivered under Alternative 3.

Environmental Water Management

Operations to improve Environmental Water Management under Alternative 3 would include the No-Diversion Period, Multiple Delta Intake Locations, and Dedicated Storage for Environmental Water.

With the **No-Diversion Period**, CCWD would cease pumping from the Delta during critical fish periods in the spring and instead rely on releases from the expanded Los Vaqueros Reservoir. **Multiple Delta Intake Locations** (Old River Intake and Pump Station and AIP) could be managed adaptively to reduce impacts on fish.

With **Dedicated Storage for Environmental Water**, additional stored water in the expanded reservoir would be reserved for environmental purposes. CCWD could refrain from pumping from the Delta and instead draw from the stored Los Vaqueros Reservoir supplies to serve its customers during periods that would allow Reclamation to retain cold water stored in upstream reservoirs. The water stored upstream of the Delta in CVP reservoirs that had been reserved for delivery to CCWD could be reallocated for environmental purposes. These purposes could include cold



SOURCE: CCWD, 2008; and ESA, 2008

Figure 3-10
Alternative 3 Schematic –
275 TAF Reservoir with No South Bay Connection

water releases to support salmon spawning or pulse flow releases to support salmon migration in addition to water for wildlife refuges or other environmental purposes. The CVP water supply foregone by CCWD in this manner could also be conveyed through the Delta by existing export facilities for environmental purposes south of the Delta.

Analysis of the use of the Dedicated Storage for Environmental Water to supply wildlife refuges south of the Delta shows a long-term annual average of about 20 TAF of water managed for environmental improvement, assuming moderate fishery restrictions. This amount increases to about 65 TAF per year in drought years.

Water Supply Reliability

Under Alternative 3, operations to increase Water Supply Reliability would include Dry-Year Storage and Emergency Storage.

Operating for **Dry-Year Storage** would increase the amount of good quality water available to CCWD from Los Vaqueros Reservoir in dry years by up to 20 TAF at the start of a drought.

Emergency Storage available to the Bay Area region under Alternative 3 is about 235 TAF. This water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through existing interties between water agencies.

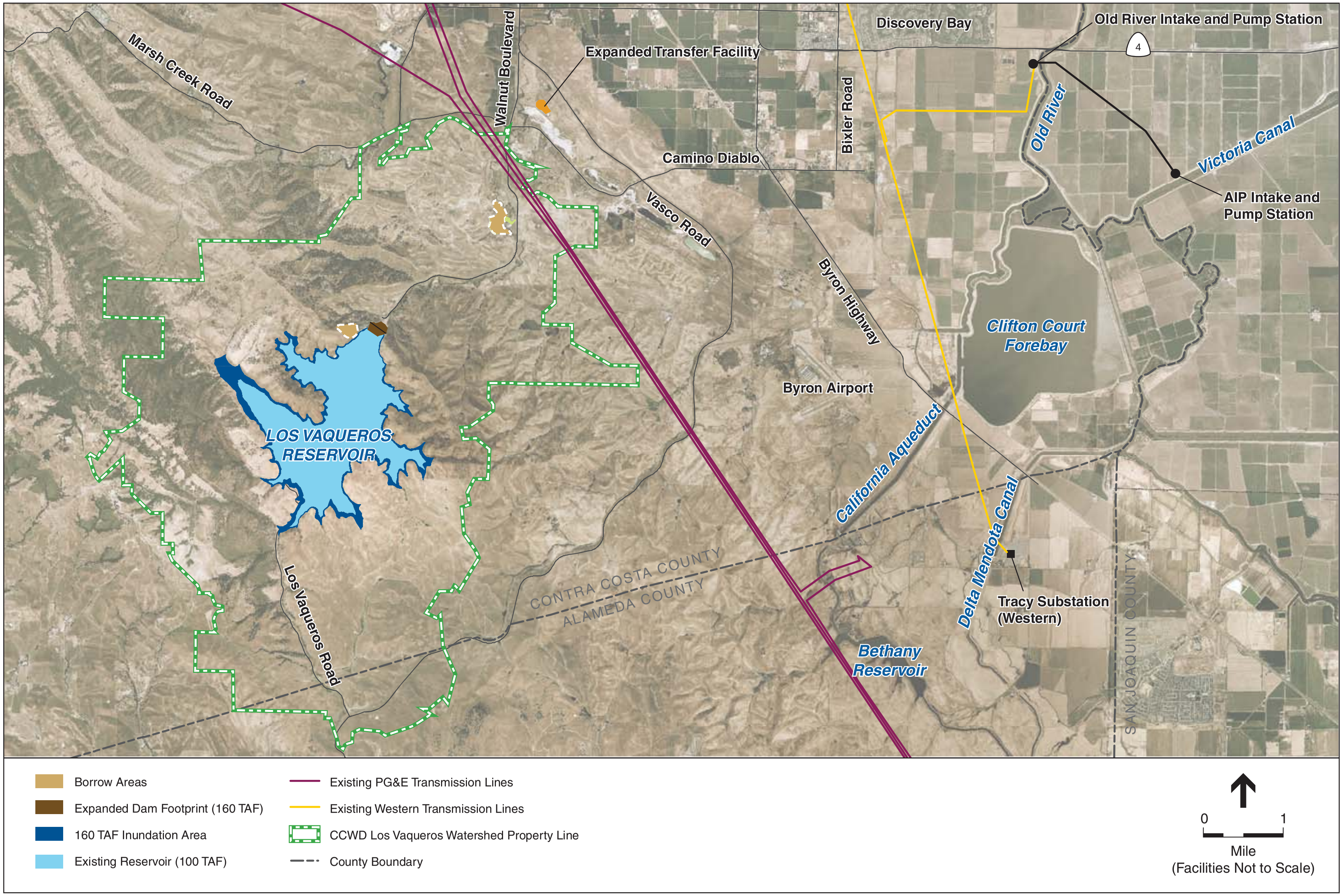
Water Quality

Additional storage in an expanded Los Vaqueros Reservoir would provide water quality improvements for CCWD in dry years by increasing the amount of water available for blending. CCWD could also receive additional incidental water quality benefits under Alternative 3 if releases of the Dedicated Storage for Environmental Water were made to reduce CCWD diversion of Delta water at times when Delta salinity is high. Such operations would not necessarily occur at times of high Delta salinity, so they do not guarantee additional water quality benefit for CCWD.

3.4.5 Alternative 4: Expanded 160-TAF Reservoir, No South Bay Connection, Water Supply Reliability Emphasis

Proposed Facilities

Alternative 4 is the smallest reservoir expansion under consideration and has fewer new or expanded facilities than under Alternatives 1, 2 and 3. Under Alternative 4, Los Vaqueros Reservoir would be expanded from 100 TAF to 160 TAF. A new Delta Intake and Pump Station would not be constructed and the Old River Intake and Pump Station would not be expanded. No increased conveyance capacity or power facilities would be constructed. The South Bay Connection would not be constructed. **Figure 3-11** shows the proposed facilities under this alternative. Figure 3-5 shows the 160-TAF reservoir inundation compared to both the Los Vaqueros Reservoir and the 275-TAF reservoir proposed under Alternatives 1, 2, and 3. Recreational facilities affected by inundation from the expanded reservoir would be relocated or replaced.



SOURCE: USDA, 2006; and ESA, 2008

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Figure 3-11
Proposed Facilities – Alternative 4

Based on preliminary design studies, minor upgrades to the existing pumps at the Transfer Facility would be required. All work would be done within the existing facility site.

Alternative 4 is a "reduced project" alternative. It has been included to evaluate the extent to which the project objectives could be achieved if a smaller reservoir were constructed to provide water supply reliability improvements and water quality benefits for CCWD and its customers and for other Bay Area water agencies that have existing interties or connections with CCWD's water supply system and that choose to participate in the project. This alternative also enables the public and decision-makers to evaluate the tradeoffs between avoiding some categories of environmental impacts by reducing the size of the reservoir and foregoing the South Bay Connection while still achieving the project objectives.

Operations

The smaller reservoir expansion constructed under Alternative 4 would be operated primarily to increase Water Supply Reliability for CCWD customers and other potential Bay Area water agency participants to which CCWD can deliver water directly through interties or indirectly by exchange in times of shortage. Operations were adjusted through an iterative analytical process (described in Appendix C) to meet the project objectives while minimizing impacts and avoiding harm to other water users.

Figure 3-12 is a schematic that shows how water would be delivered under Alternative 4.

Environmental Water Management

Operations to improve Environmental Water Management under Alternative 4 would include the No-Diversion Period and Multiple Delta Intake Locations. Additional operations required under the current Biological Opinions that govern CCWD's operation of the existing Los Vaqueros Reservoir are assumed to be in place under this alternative, including a 75-day no-fill period in the spring.

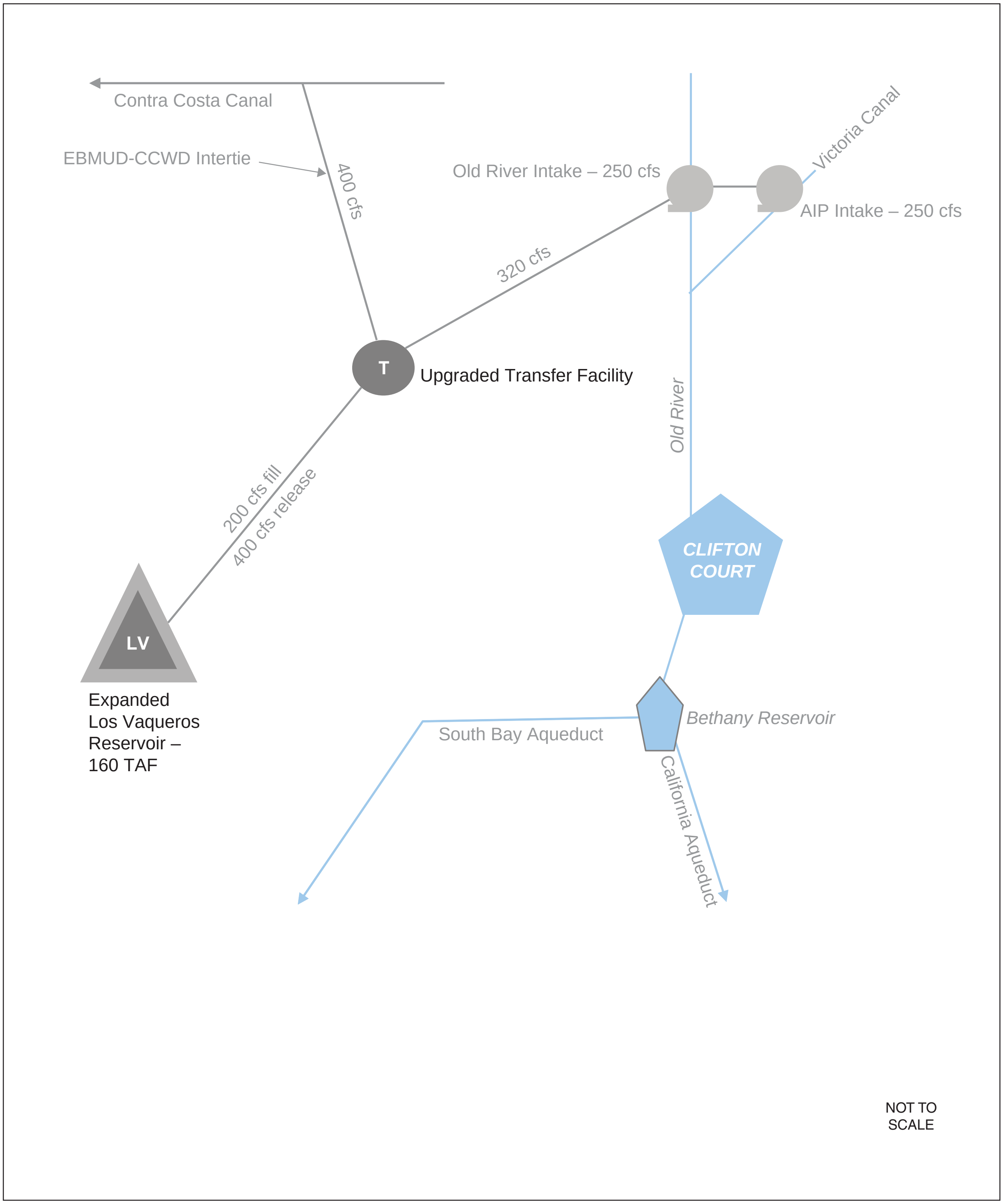
During the **No-Diversion Period**, CCWD would cease pumping from the Delta during critical fish periods in the spring and instead rely on releases from the expanded Los Vaqueros Reservoir as it currently does. The additional storage constructed under Alternative 4 would reduce the number of years in which CCWD is exempt from the No-Diversion Period when there is insufficient stored water in Los Vaqueros Reservoir. However, this increased benefit would be small.

Multiple Delta Intake Locations (Old River Intake and Pump Station and AIP) would continue to be managed adaptively to reduce impacts to fish.

Although not assumed in the water modeling for this Draft EIS/EIR, the 160-TAF reservoir could be operated with Dedicated Storage for Environmental Water.

Water Supply Reliability

Under Alternative 4, operations to increase Water Supply Reliability would include Dry-Year Storage and Emergency Storage.



SOURCE: CCWD, 2008; and ESA, 2008

Figure 3-12
Alternative 4 Schematic –
160 TAF Reservoir with No South Bay Connection

Operating for **Dry-Year Storage**, would increase the amount of good quality water available from Los Vaqueros Reservoir to CCWD and other participating Bay Area water agencies to which CCWD can deliver water directly through interties or indirectly by exchange. The increase in available water would be up to 60 TAF at the start of a drought.

Emergency Storage available to the Bay Area region under Alternative 4 is about 120 TAF. This water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through existing interties between water agencies.

Water Quality

Additional storage in an expanded Los Vaqueros Reservoir would provide water quality improvements for CCWD in dry years by increasing the amount of water available for blending, to a greater extent than under Alternatives 1, 2, and 3.

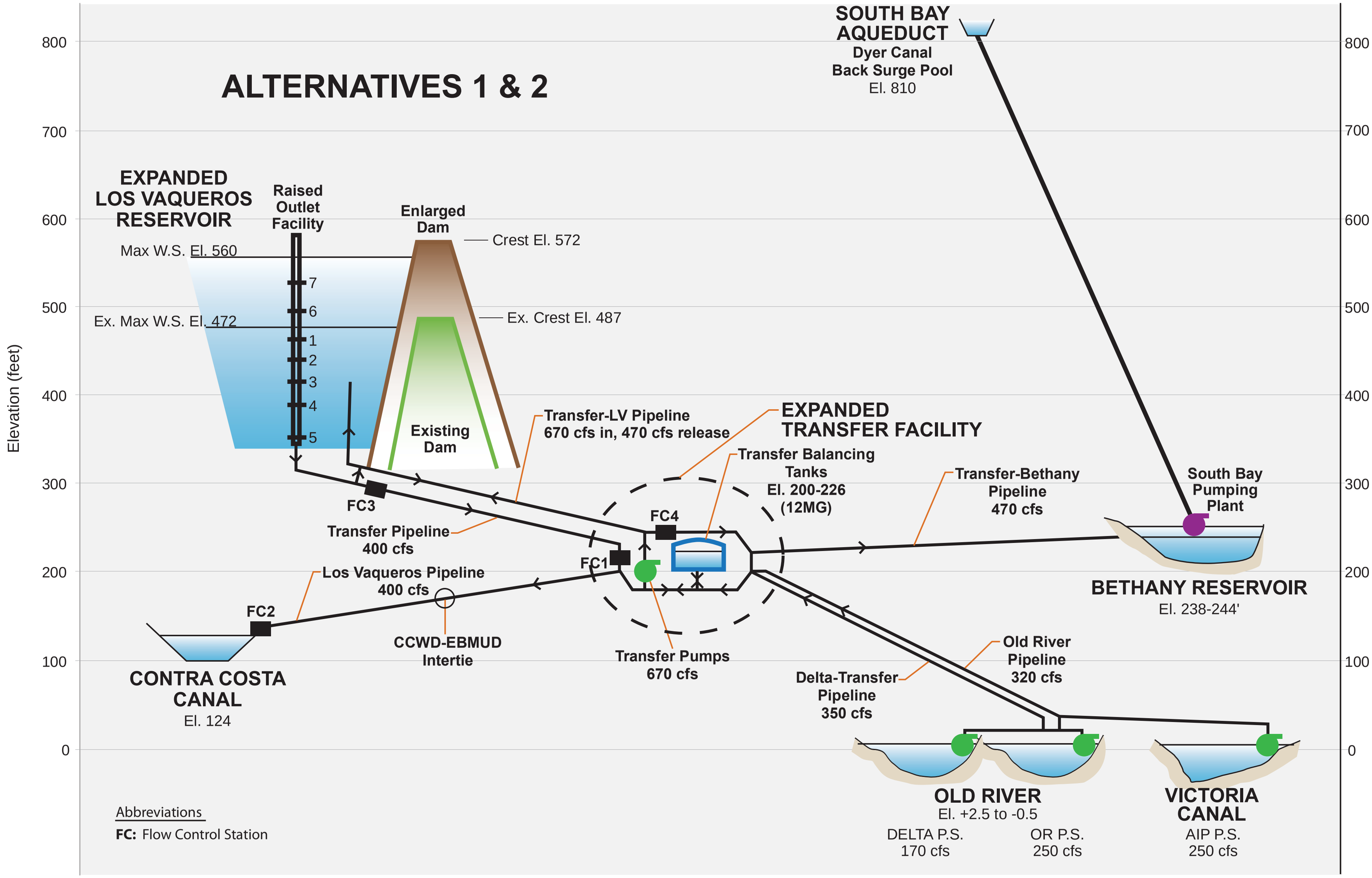
3.5 Proposed Facilities – Detailed Description

This section presents details regarding site location, conceptual facility layout, design, and construction for the proposed new or expanded facilities under the four action alternatives. The section also describes how the proposed facilities would be operated in conjunction with CCWD's existing water system facilities. **Figure 3-13** is a hydraulic profile of the existing and proposed facilities under Alternatives 1 and 2, which illustrates how the facilities are related in terms of function and elevation and how water moves through the system by a combination of pumping and gravity flow.

3.5.1 Los Vaqueros Reservoir Expansion / Dam Modification

The existing 100-TAF Los Vaqueros Reservoir provides offstream storage of water that is diverted by CCWD from Old River when source water quality meets CCWD's standards. From the reservoir, CCWD can deliver water to the Contra Costa Canal, via the Transfer and Los Vaqueros Pipelines, for blending with other CCWD supplies. Under Alternatives 1, 2, and 3, the Los Vaqueros Reservoir would be expanded to 275 TAF. Under Alternative 4, the reservoir would be expanded to 160 TAF. Under the No Project/No Action Alternative, no reservoir expansion would take place. Reservoir expansion under the four action alternatives would involve raising the existing dam rather than replacing it with a completely new, larger dam facility.

The Los Vaqueros Reservoir was designed for 100 TAF of storage, and no specific allowance was made in the dam's design to accommodate a future expansion. However, planning studies for the Los Vaqueros Reservoir Expansion Project determined that raising the existing dam to a limited extent would be feasible and would allow for a reservoir expansion up to 275 TAF. The amount of dam raise possible is limited by a combination of topographic constraints and the design of the dam. Reservoir expansion to 275 TAF represents the maximum expansion considered feasible by raising the existing dam rather than replacing it with a completely new dam.



SOURCE: URS, 2008; CCWD, 2008; and ESA, 2008

Figure 3-13
System Elevation Schematic

Reservoir expansion to 275 TAF would raise the water surface level 88 feet for a maximum reservoir water surface elevation of 560 feet msl. The reservoir water surface area (inundation area) would expand approximately 1,000 acres from 1,500 acres to 2,500 acres. The more limited reservoir expansion to 160 TAF, as proposed under Alternative 4, would raise the water surface level 38 feet for a maximum reservoir water surface elevation of 510 feet msl. Under Alternative 4, the reservoir inundation area would increase approximately 400 acres from 1,500 acres to 1,900 acres.

Reservoir expansion would involve the dam raise modifications as well as construction of appurtenant facilities including the spillway, the inlet/outlet works, and the reservoir oxygenation system. Each of these is described in more detail below.

Dam Raise Design

Table 3-4 summarizes the characteristics of the dam raise for both the 275-TAF reservoir expansion (Alternatives 1, 2, and 3) and the 160-TAF reservoir expansion (Alternative 4). For both reservoir expansion scenarios, the existing dam would be raised by building on top of the existing dam structure as described below.

TABLE 3-4
CHARACTERISTICS OF THE LOS VAQUEROS DAM MODIFICATION

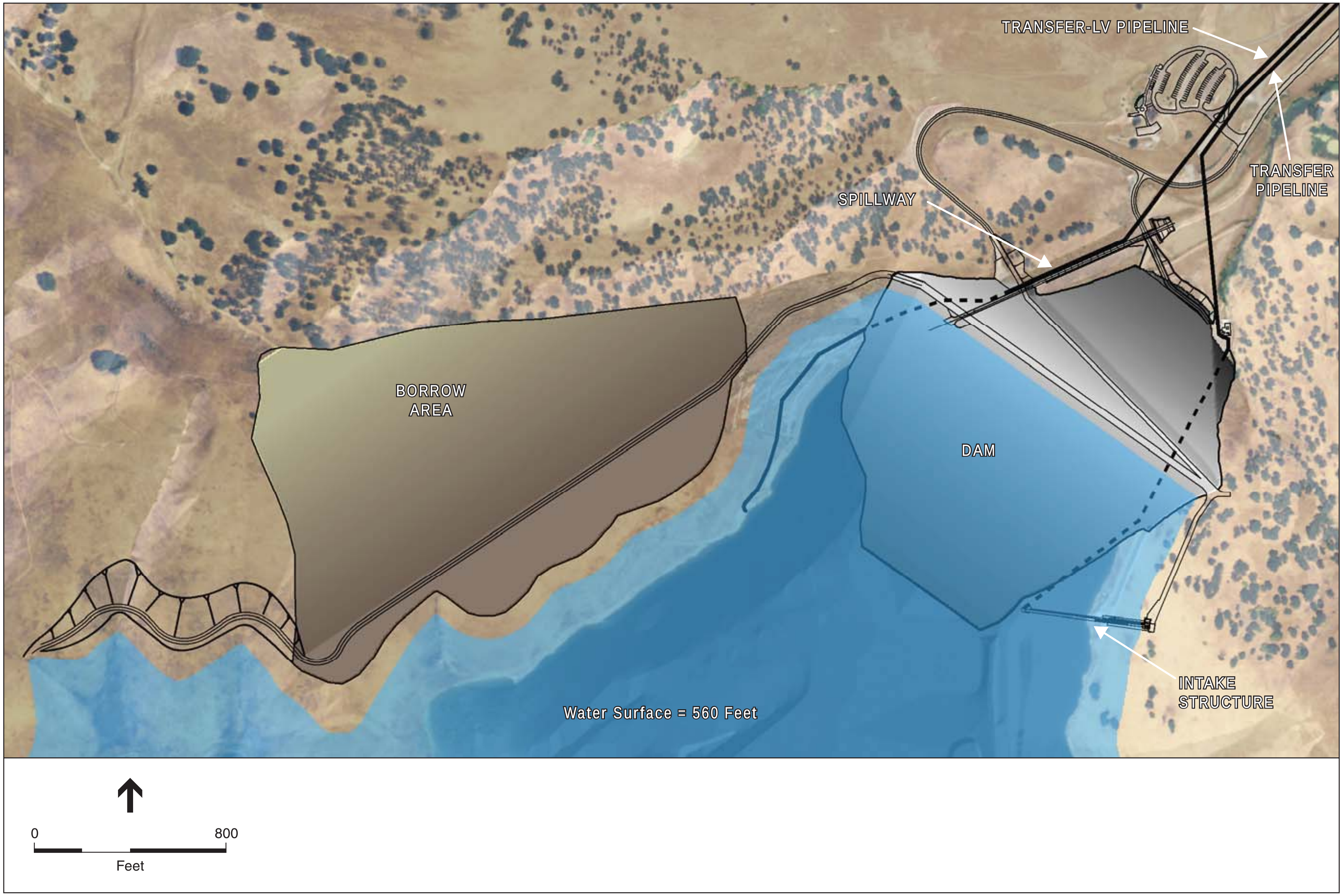
Reservoir Capacity (TAF)	Maximum Reservoir Water Surface Elevation (msl)	Dam Crest Elevation (msl)	Maximum Dam Height Above Downstream Toe (feet)	Total Embankment Volume (Existing plus New) (million cubic yards)	Dam Crest Length (feet)
Existing Reservoir					
100	472	487	192	2.8	1,000
Alternative 4					
160	510	523	230	3.8	1,300
Alternatives 1, 2, and 3					
275	560	572	282	7.6	1,630

msl = mean sea level
TAF = thousand acre-feet

SOURCE: URS, 2007

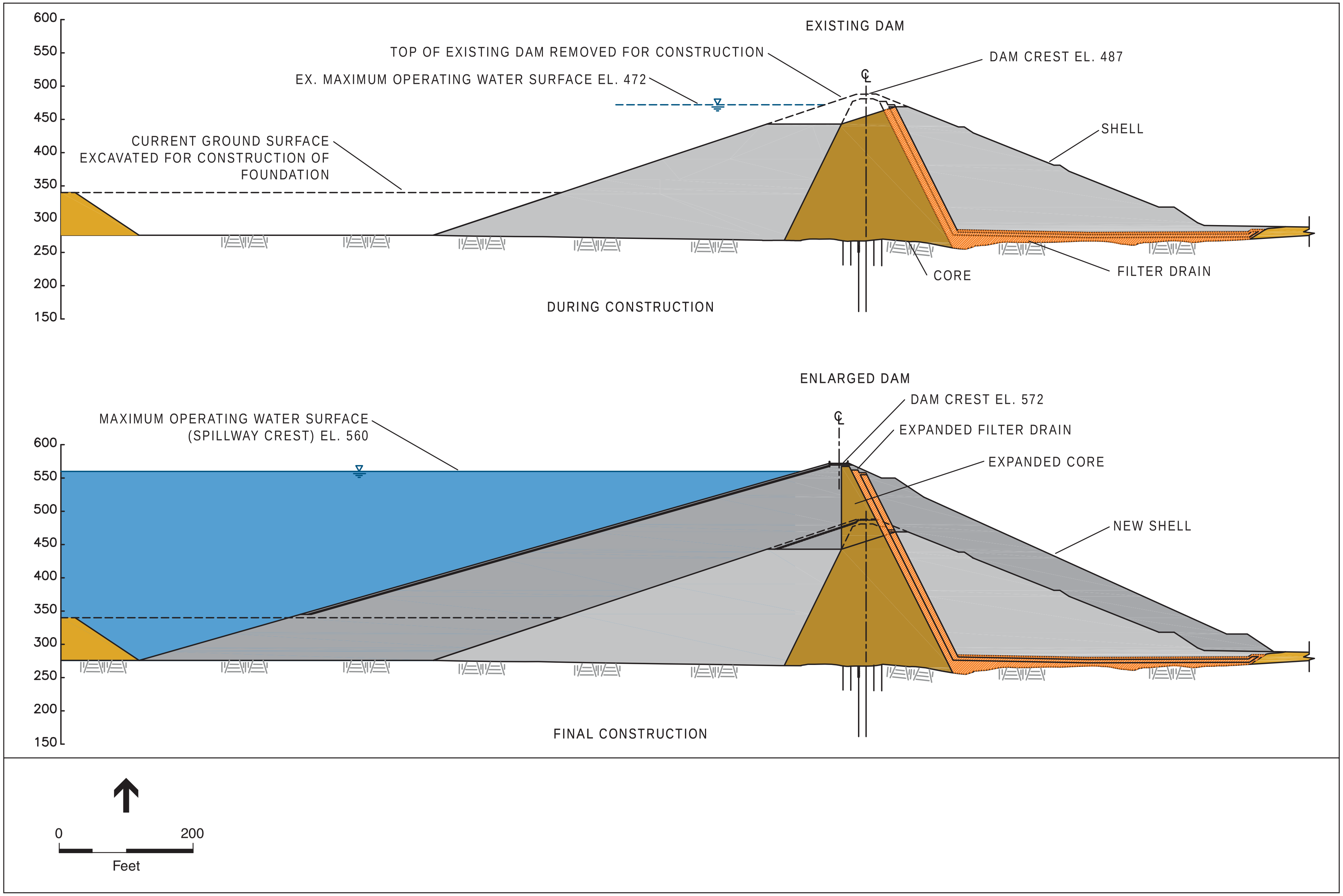
275-TAF Reservoir – Alternatives 1, 2, and 3

Like the existing dam, the raised dam would be a central core earthfill embankment. **Figure 3-14** shows a plan view of the proposed 275-TAF reservoir dam, and **Figure 3-15** shows a profile view of the raised dam atop the existing dam. The dam would be raised by building on top of both the upstream and downstream shells of the dam. The existing vertical central core and the filter/drainage system would be raised as shown in Figure 3-15. The dam axis would move about 45 feet upstream.



SOURCE: URS Corporation, 2008; and ESA, 2008

Figure 3-14
275 TAF Reservoir – Plan View of Dam Raise and Borrow Area



SOURCE: URS Corporation, 2008; and ESA, 2008

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Figure 3-15
275 TAF Reservoir – Profile View of Dam Raise

The dam would be 282 feet high and have a crest (or top) elevation of 572 feet msl. The water surface elevation would be 560 feet msl when expanded to the 275-TAF capacity. The dam crest would be 30 feet wide and about 1,630 feet long. The downstream and upstream slopes would be about 2.25:1 and 3.5:1, respectively. The new embankment fill would add about 4.8 million cubic yards to the current dam volume of 2.8 million cubic yards for a total of 7.6 million cubic yards of embankment fill.

The existing reservoir would need to be drained prior to construction. It would remain drained and out of service throughout the estimated 3-year construction period and be refilled following construction completion. The process of draining the reservoir is described below (see "Construction").

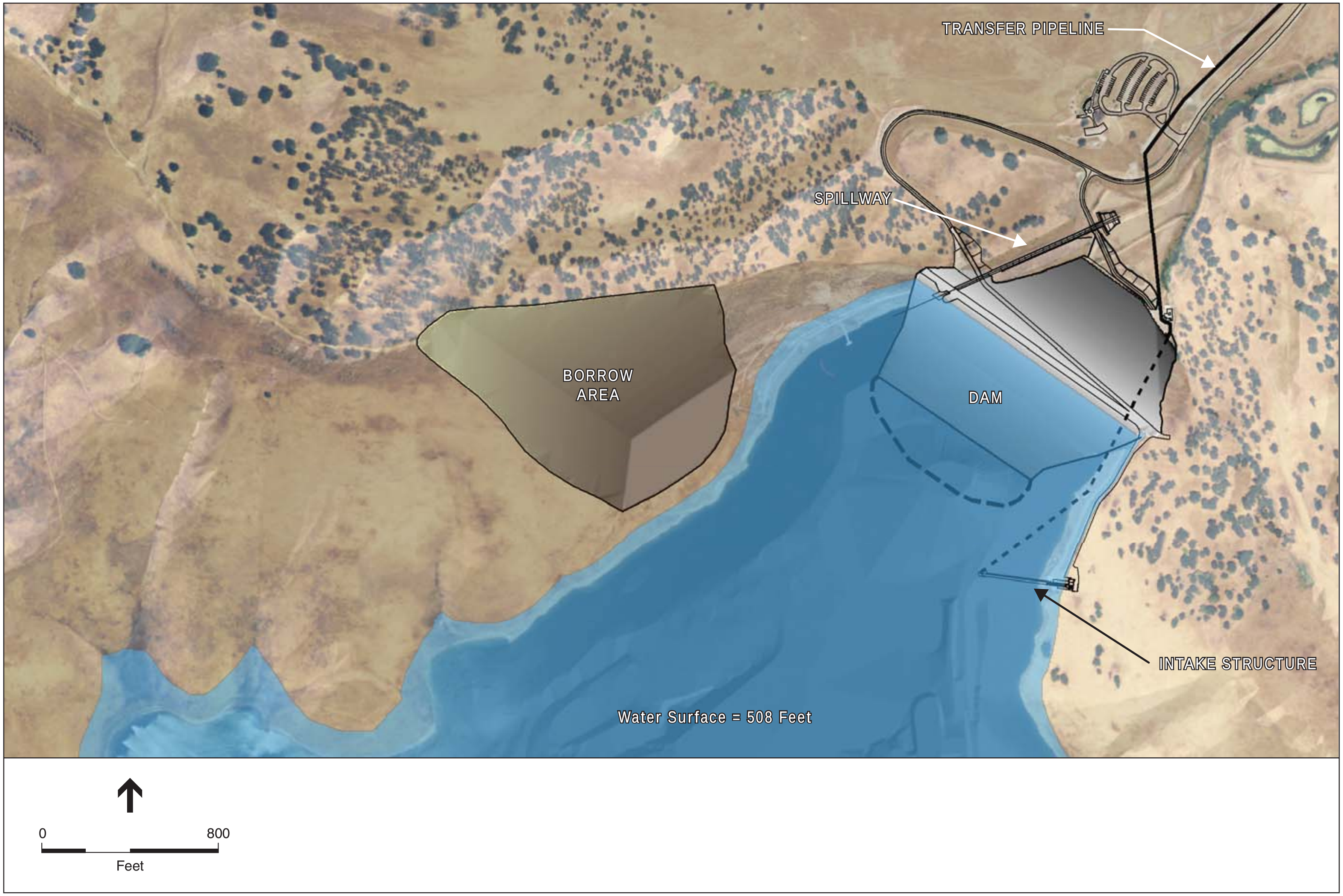
The raised dam would include monitoring and recording instrumentation, similar to the existing equipment, to measure internal water pressures within and seepage from the dam and foundation, settlement of the dam, and earthquake-induced accelerations and deformations. The instruments would include foundation and embankment piezometers, internal and surface settlement and movement sensors, a seepage measurement weir and a series of strong motion acceleragraphs.

160-TAF Reservoir – Alternative 4

Like the existing dam, the raised dam would be a central core earthfill embankment. A plan view of the potential 160-TAF reservoir dam is shown in **Figure 3-16** and a profile view of the raised dam atop the existing dam is shown in **Figure 3-17**. The dam would be raised by building on the downstream shell. The existing vertical central core and filter/drainage system would be raised as shown in Figure 3-16. The dam axis would move about 20 feet downstream. The dam would be 230 feet high and have a crest elevation of 523 feet msl. The reservoir water surface elevation would be 510 feet msl when expanded to the 160-TAF capacity. The crest would be 30 feet wide and about 1,300 feet long. The downstream and upstream slopes would be approximately 2.25:1 and 3.0:1, respectively. The new embankment fill would add about 1 million cubic yards to the current dam volume of 2.8 million cubic yards for a total of approximately 3.8 million cubic yards of embankment fill (see Table 3-4).

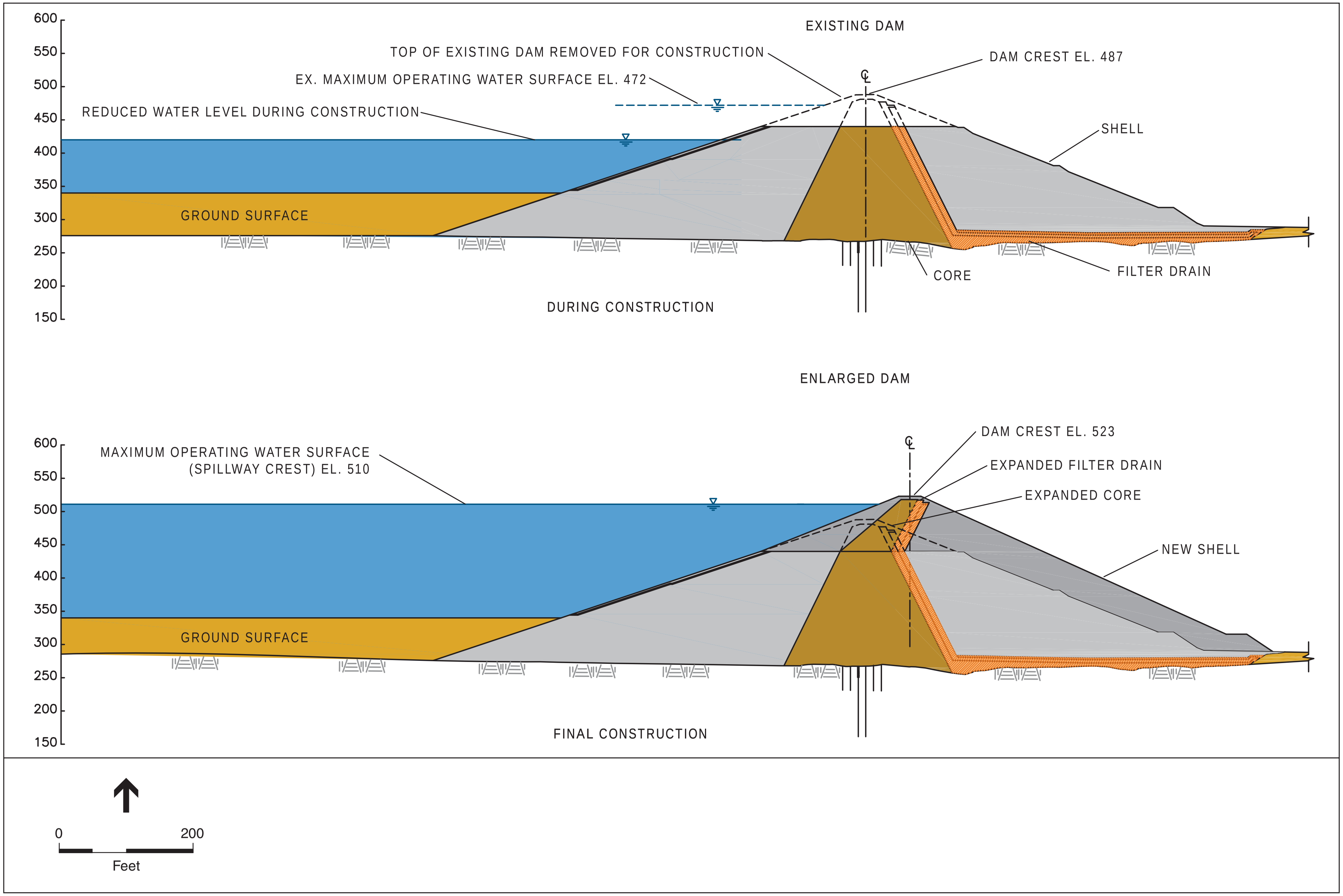
The reservoir could remain in operation through most of construction although reservoir drawdown of about 60 TAF may be necessary during the construction period. Determination of the extent of the final drawdown would be made through consultation with DWR's Division of Safety of Dams (DSOD) during final design.

The raised dam for the 160-TAF reservoir would have the same monitoring and recording instrumentation as described for the 275-TAF reservoir.



SOURCE: URS Corporation, 2008; and ESA, 2008

Figure 3-16
160 TAF Reservoir – Plan View of Dam Raise and Borrow Area



SOURCE: URS Corporation, 2008; and ESA, 2008

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Figure 3-17
160 TAF Reservoir – Profile View of Dam Raise

Appurtenant Facilities

Spillway

The spillway (a channel over the dam that allows for overflow from the reservoir) for both the 275-TAF and 160-TAF reservoirs would be an extension of the existing spillway on Los Vaqueros Dam. The new portion of the spillway for both reservoir expansion options would be about 375 feet long and, like the existing chute, would have a rectangular cross-section of 15 feet. The existing stilling basin (an impoundment to slow the water conveyed through the spillway) at the base of the chute and a riprap-lined discharge channel to Kellogg Creek would be retained under either expansion option. The spillway would have the capacity to convey the Probable Maximum Flood to ensure that even in the most extreme storm conditions, water levels in the reservoir would not overtop the dam.

Inlet / Outlet Works

275-TAF Reservoir

Getting water into and out of an expanded 275-TAF reservoir would require some new facilities as well as modifications to existing inlet/outlet facilities. A new inlet pipe connected to the Transfer-LV Pipeline at the dam would convey water into the reservoir at a rate of up to 670 cfs. The inlet would be a buried 10-foot-diameter steel pipeline that would be routed adjacent to, and parallel with, the existing spillway chute. The pipeline would route the water through the concrete buttress and along the left abutment to a single discharge port into the reservoir.

The existing outlet facilities on the right dam abutment would be expanded and used to release water from a 275-TAF reservoir. The existing facility is a 7-foot-diameter, steel-lined sloping structure with five ports that can be used to release water from different reservoir water levels to satisfy water quality needs. This structure would be extended up above the new maximum storage elevation and up to three additional ports would be added. Water flowing out of the reservoir through the port structure (also known as an intake structure because water is being brought *into* a water system from a reservoir) would be routed through the existing steel-and concrete-lined outlet tunnel to an outlet structure at the toe of the dam that includes various valves and connects to the Transfer-LV Pipeline that runs to the Transfer Facility. The existing outlet tunnel, outlet structure, and associated valves would be reused without major modification. The existing control building would be demolished and a new building constructed at the top of the raised intake structure.

DSOD guidelines for emergency drawdown (or "evacuation") of large reservoirs require that the dam facilities have the capability to lower the reservoir level by an amount equal to 10 percent of the hydraulic head behind the dam in ten days, and to evacuate the entire reservoir in 120 days. These guidelines are met at Los Vaqueros Reservoir via the outlet tunnel and a valve in the outlet structure that discharges the emergency release flows directly into Kellogg Creek. The maximum discharge rate is currently 1,140 cfs, which exceeds the 10-day average rate of 910 cfs needed to meet the first of DSOD's two guidelines.

The greater storage volume in the 275-TAF reservoir (Alternatives 1, 2, and 3) would increase the 10-day average rate of discharge to meet the state guidelines to 2,430 cfs. Under these alternatives, the discharge flow would be split between the existing outlet tunnel and valve and the new inlet conduit. With the additional 88 feet of reservoir head and with the valve fully open, the maximum discharge rate through the existing outlet tunnel would increase to 1,500 cfs. This flow would be discharged to Kellogg Creek. The remaining 930 cfs would be released through the new inlet conduit and Transfer-LV pipeline to either Bethany Reservoir via the Transfer-Bethany Pipeline (Alternatives 1 and 2) or to Old River via the Delta Transfer and Old River Pipelines.

160-TAF Reservoir

The existing inlet/outlet works would be retained with this level of expansion. Pumping into and releasing water from the reservoir would occur via the existing facilities through the right abutment. The existing outlet facility (also called the intake structure) would be extended up above the new maximum storage elevation, but no additional ports would be added. The existing control building would be demolished and a new building constructed at the top of the raised intake structure. Other changes to the outlet structure and associated valves would not be necessary. Emergency reservoir drawdown requirements would be met with the current outlet tunnel and valve, although with the increased head, a larger valve may be required. This valve releases water down Kellogg Creek.

Reservoir Oxygenation System

The existing reservoir has an oxygenation system that is designed to enhance the quality of water in the hypolimnion, which is the bottom or lower zone of water within the reservoir. This system would need to be relocated and/or upgraded to accommodate either the 160-TAF or 275-TAF reservoir. Oxygenating the hypolimnion helps maintain sufficient residual oxygen in the deeper reservoir waters, which improves water quality, reduces tastes and odors so water from this level in the reservoir can be used for consumption, and makes the water habitable for fish. During the oxygenation process, liquid oxygen (LOX) is vaporized, piped to a diffuser grid on the bottom of the reservoir, and then released into the reservoir as oxygenated bubbles.

The existing oxygenation facilities are on the downstream face of the dam and include two horizontal liquid oxygen tanks, ambient vaporizers, control valving, instrumentation and telemetry panel, and site access for LOX delivery and operation personnel. LOX is generated off site and trucked to facility storage tanks. These facilities would be relocated in the same general area as part of the dam modification process under any alternative and may be upgraded to effectively oxygenate the larger reservoir.

Construction

Construction of the expanded reservoir would involve the dam raise as well as construction of the appurtenant facilities. The following subsections describe the construction of these aspects of the project.

Dam Raise Materials

Raising the existing dam requires additional claystone and sandstone materials to enlarge the dam shell as well as clay material to extend the dam core. To minimize truck trip length and associated emissions and to reduce cost, most of the materials for the dam raise would be obtained from sites within the watershed from designated borrow areas. The dam for both the 275-TAF and 160-TAF reservoirs would have a system of filters and drains to control seepage through the dam and foundation. Materials for sand filters and gravel drains would be imported from commercial sources within the region. Haul distances would be between 25 and 30 miles. Other materials required for construction of the dam raise and associated facilities include both raw and pre-fabricated materials that would be transported to the project site such as gravel, aggregate, bulk cement, steel, pipeline segments, pre-fabricated building materials, and mechanical and electrical equipment.

Sand, gravel, and rock materials imported to the project area would be tested prior to acquisition and transport to determine the presence of hazardous, corrosive, or other substances that could affect use of the materials, environmental exposure, or disposal options. CCWD's construction specifications require contractors to ensure these materials meet industry standards set forth by the American Society of Testing and Materials, among other groups.

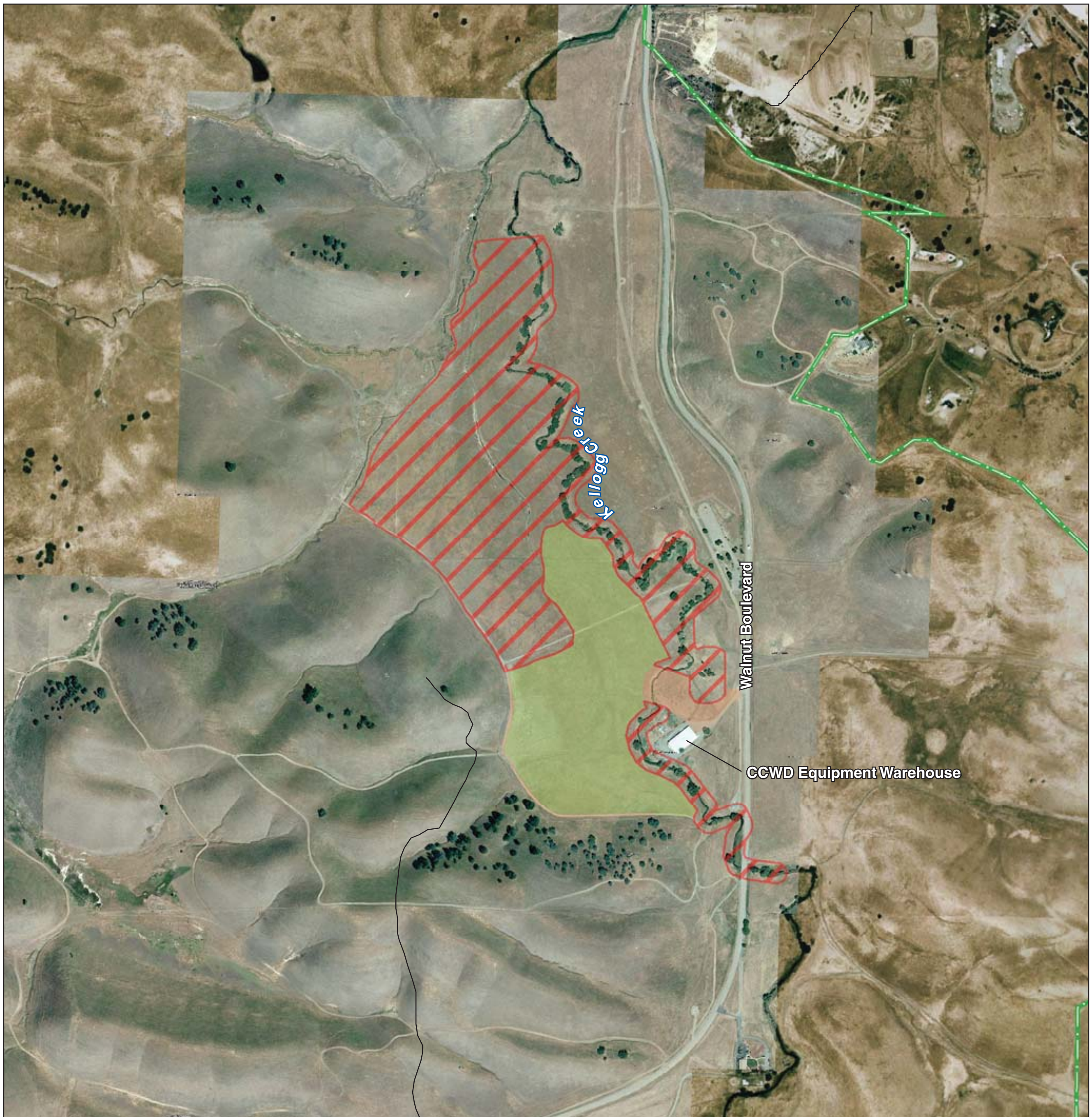
Material Borrow Areas

Shell Borrow Area (275 TAF and 160 TAF). The upstream and downstream dam shell would be constructed of claystone and sandstone obtained from a borrow area just upstream of the left abutment (see Figures 3-14 and 3-16, respectively). The borrow area would be about 36 acres for the larger 275-TAF dam raise and 22 acres for smaller 160-TAF dam raise. This borrow area would be an extension of the borrow area developed for the construction of the existing dam. Riprap to armor the upstream slope would also be obtained from this borrow area.

Core Borrow Area (275 TAF). The clay for the central core of the 275-TAF reservoir dam would be excavated from the alluvial clay deposits naturally occurring on the floor of the reservoir from the general area where the core materials for the existing dam were obtained. This area is inundated by the existing reservoir.

Core Borrow Area (160 TAF). For the 160-TAF reservoir dam, alluvial clay deposits on the floor of the existing reservoir would not be available for use in constructing the dam raise because the reservoir would not be fully drained. Therefore, approximately 270,000 cubic yards of clay would be excavated from the naturally occurring alluvial deposits in the valley floor approximately 2.5 miles downstream of the dam. Because the engineering properties of these alluvial deposits are still under investigation, the specific location and size of this borrow area is being evaluated. Therefore, a borrow area zone has been identified for impact analysis purposes, as shown in **Figure 3-18**. Restricted areas, where no borrow activities would occur, have been identified based on the evaluation of sensitive biological and potential cultural resources. The area marked in green on Figure 3-18 is the proposed area for borrow activities analyzed in this EIS/EIR. For purposes of this analysis, it is assumed that access to the borrow area for the 160-TAF reservoir dam would be via an existing access road off Walnut Boulevard and a new temporary bridge to be installed over Kellogg Creek.

The specific location and layout of the borrow area has yet to be determined within the siting zone. The dimensions and depth of this borrow area will depend on the location, depth, and quality of the clays available. Topsoil would be removed from the borrow area, the underlying clay extracted



No Borrow Zone – Biological and/or Cultural Resources Constraints
Borrow Area for Core Material
Access Road and Bridge
CCWD Los Vaqueros Watershed Property Line

0 1000
Feet

SOURCE: GlobeXplorer, 2007; and ESA, 2008

Figure 3-18
160 TAF Reservoir – Core Borrow Area

and the topsoil replaced. This area would be restored and revegetated once borrow activities are completed and would be evaluated as a possible site for creation of compensatory wetlands and/or ponds for California red-legged frog (*Rana draytonii)*, California tiger salamander (*Ambystoma californiense*) and/or vernal pool fairy shrimp as part of the project mitigation program.

Materials and Equipment Stockpile and Staging Areas

Although the dam raise would be constructed in large part from local materials quarried from nearby borrow areas, certain materials would need to be imported and stockpiled near the dam in sufficient quantity to maintain an adequate flow of materials. Some material would be stockpiled adjacent to the existing dam on the downstream side. In addition, for Alternatives 1, 2, and 3, another estimated 15-acre stockpile/staging area was identified along Walnut Boulevard near the entrance to the watershed. Alternative 4 would not require a 15-acre stockpile/staging area.

Materials Disposal

For the 275-TAF reservoir, excess earthen materials would be disposed of within the reservoir inundation zone at a suitable distance from the dam to avoid interference with reservoir operations. For the 160-TAF reservoir, excess earthen materials would be disposed immediately downstream at the toe of the dam. Although not expected based on experience from construction of the original dam, any spoils or waste materials not suitable for disposal in the reservoir inundation zone or at the dam site would be hauled to a suitable location for recycling or disposal. The final disposal areas selected would depend on the type and volume of material to be disposed.

Draining the Reservoir for Construction

275-TAF Reservoir

Raising the existing dam for expansion to 275 TAF (Alternatives 1, 2, and 3) would require construction on the upstream and downstream sides of the existing dam and would therefore require that the reservoir be empty during construction. Draining the reservoir would be accomplished primarily by the planned release of the water into the CCWD distribution system, which could take six months to one year to accomplish. The existing reservoir water elevation would be drawn down to the level of the lowest port on the existing reservoir outlet (350 feet in elevation). The remaining 3 to 4 TAF of water that could not be released through the dam outlet would be pumped out through the lower port. It is expected that this water would be adequately mixed and aerated and would be either sent down the transfer pipeline for use in the CCWD service area or discharged to a creek or drainage channel consistent with regulations. Any water not suitable for release may require evaporation ponds or special treatment.

The Los Vaqueros Reservoir would be out of service for about four years from the time the reservoir was completely drained to allow for construction of the dam expansion through refilling the expanded reservoir. The amount of time needed to refill the reservoir would depend on hydrologic conditions and Delta water quality during the refilling. During this period, CCWD would be able to meet its water quality goals in all but short portions of the driest years through use of the AIP facility on Victoria Canal and the East Bay Municipal Utility District (EBMUD)-CCWD Intertie. Under current reservoir operations, most blending for water quality is done in the fall when the quality at the Old River Intake and Pump Station declines. However, water quality is higher at the AIP during the fall, allowing water quality goals to be met with direct deliveries in most years. Additionally, under CCWD's agreement with EBMUD, 3,200 acre-feet per year of CCWD's CVP water can be diverted through the Freeport Regional Water Project facilities in the northern Delta where water quality is significantly better than at the Old River Intake and Pump Station. CCWD would coordinate with EBMUD to take this water when it would provide the most water quality benefit to CCWD customers. The intertie with EBMUD could also provide water in an emergency.

160-TAF Reservoir

The limited dam raise necessary to expand the reservoir to 160 TAF could be achieved by constructing on the downstream slope of the existing dam only, allowing the reservoir to remain in operation through the majority of construction. A drawdown of up to 60 TAF would be necessary during the construction period; however, the final determination of the extent of the drawdown would be made through consultation with DSOD during final design.

Kellogg Creek Flow Bypass

For Alternatives 1, 2, and 3, once the remaining water is removed, a groundwater cutoff trench would be installed upstream of the dam footprint to enable excavation of the foundation upstream of the toe of the existing dam. A temporary cofferdam would be constructed upstream of the cutoff trench. A temporary diversion pipe would be installed to divert any inflows from Kellogg Creek around the dam and into Kellogg Creek to maintain the flows required in CCWD's water rights and Biological Opinions and to sustain the habitats dependent on these flows.

Construction Activities

275-TAF Reservoir

Construction of the 275-TAF reservoir dam, including appurtenant facilities, is estimated to require 24 to 30 months. As described above, prior to construction, water would be drained from the existing reservoir. Once the remaining water is removed, a groundwater cutoff trench would be installed upstream of the dam footprint to enable excavation of the foundation upstream of the toe of the existing dam. A temporary cofferdam would be constructed upstream of the cutoff trench.

About 1,000,000 cubic yards of wet alluvium and spoil from the existing dam would be excavated between the groundwater cutoff and the upstream shell of the dam. The wet soil would be moved to a location on the reservoir floor to dry.

Construction of the dam embankment would begin in the second half of Year 1 and be completed in Year 2. Grouting the upper abutments would occur concurrently with foundation excavation and embankment fill placement. About four months would be required to place about 100,000 cubic yards of concrete on the left abutment.

Construction of the extension of the existing sloping intake tower and structural modification of the existing outlet control structure could be completed in the first construction season. Construction of the mechanical/electrical and structural components of the outlet sloping intake structure and the downstream inlet/outlet control structures would be completed in Year 1 once the extension of the sloping intake structure is finished.

Equipment would include dump trucks, a small bulldozer, vibratory rollers, front-end loaders, and the concrete mixing plant.

160-TAF Reservoir

Construction of the 160-TAF reservoir dam is estimated to require 18 months to reach substantial completion (including a three-month hiatus during the winter). Mobilization, including construction of access roads, would occur during the first quarter of Year 1. The reservoir would be drawn down to the level required for construction prior to construction. Downstream excavation and construction of the additional embankment fill would begin in the second quarter of Year 1 and be completed by the end of the year.

Grouting the upper abutments would occur concurrently with foundation excavation and embankment fill placement. Approximately two months would be required to place 20,000 cubic yards of concrete on the left abutment. Equipment would include dump trucks, a small bulldozer, vibratory rollers, front-end loaders, and the concrete mixing plant.

Construction of the extension of the existing sloping intake tower and structural modification of the existing outlet control structure could be completed concurrently with fill placement. Construction of the mechanical/electrical and structural components of the outlet sloping intake structure and the downstream inlet/outlet control structures would be completed once the extension of the sloping intake structure is finished.

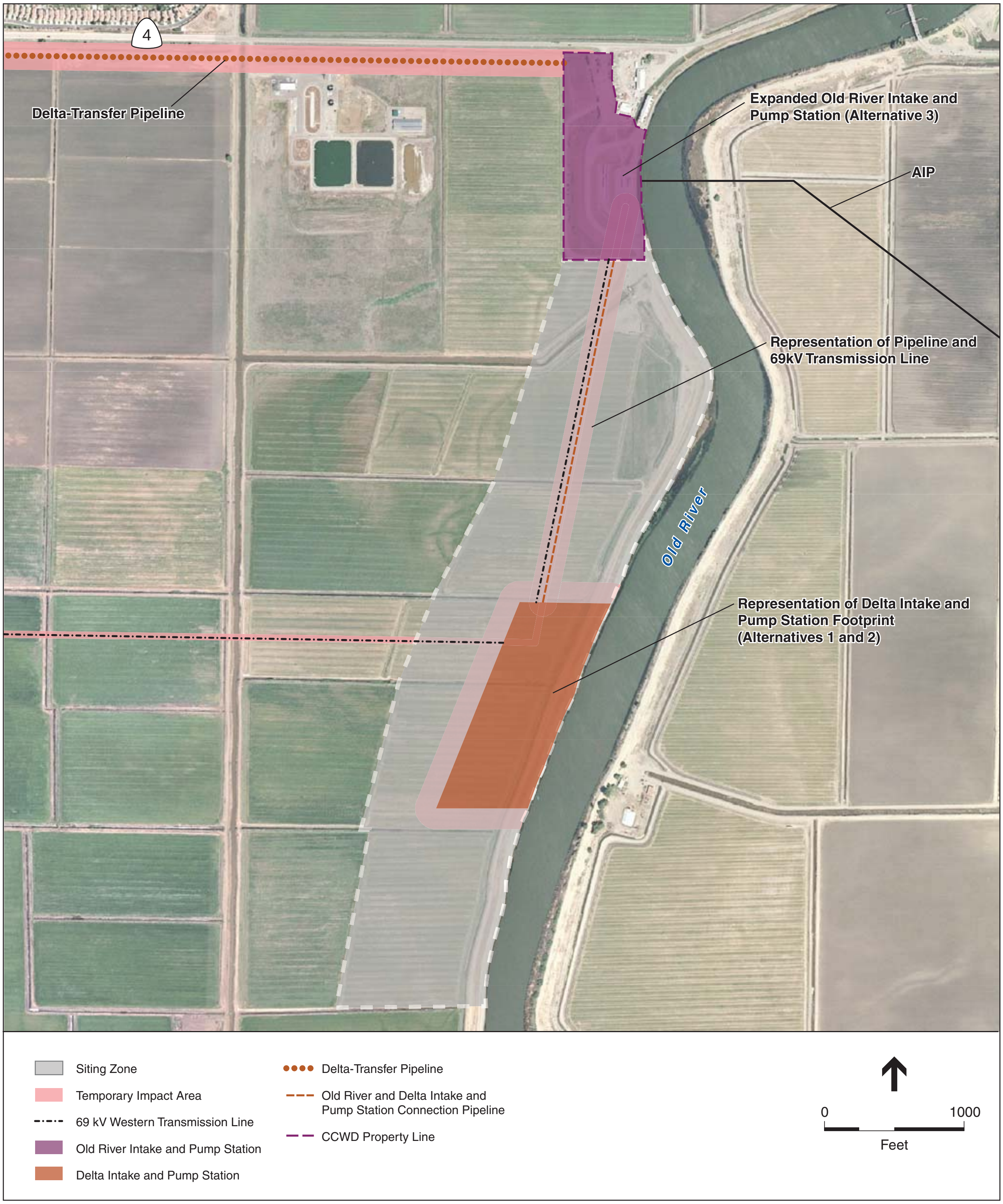
3.5.2 Delta Intake Facilities

All four alternatives would incorporate operation of CCWD's existing Delta intakes (AIP and Old River Intake and Pump Station) into their operations. Alternatives 1 and 2 would also require construction of a new intake and pump station to divert Delta water. Alternative 3 would include an expansion of the Old River Intake and Pump Station. Alternative 4 would not include any additional intake capacity. The intake facilities are shown on **Figure 3-19**. The relationship of the intakes to the rest of the expanded Los Vaqueros Reservoir system is shown on Figure 3-13.

New Delta Intake and Pump Station

Site Location and Design

Under Alternatives 1 and 2, a new Delta Intake and Pump Station would be required to pump water from Old River and convey it to the Transfer Facility and/or the South Bay Connection (Bethany Reservoir). The additional capacity is needed because more water would be pumped to fill the larger reservoir and for direct delivery to the South Bay water agencies. Water pumped from the new Delta Intake and Pump Station to the Transfer Facility would then either be pumped up to the expanded reservoir or continue through the Transfer-Bethany Pipeline to Bethany Reservoir. The new Delta Intake and Pump Station facility would be along Old River east of Byron and south



SOURCE: GlobeXplorer, 2007; and ESA, 2008

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Figure 3-19
Intake Facilities

of State Route 4, just south of CCWD's existing Old River Intake and Pump Station, as shown in Figure 3-19.

The new Delta Intake and Pump Station would be sited on approximately 22 acres. Additional engineering and geotechnical investigations are required to select the final site location. Therefore, for purposes of this EIS/EIR, a broader siting zone has been evaluated within which the 22-acre facility would be located (See Figure 3-19). A pipeline connecting the new Delta Intake and Pump Station to the Old River Intake and Pump Station and a 69-kilovolt (kV) electrical transmission line would be installed within this siting zone.

The new Delta Intake and Pump Station would include a reinforced concrete wet well structure with state-of-the-art positive barrier fish screens. An earthen setback levee would be constructed around the site to provide levee protection during construction of the intake and to maintain continuity of the road system along the levee after construction. A conceptual layout of this facility is shown on **Figure 3-20**.

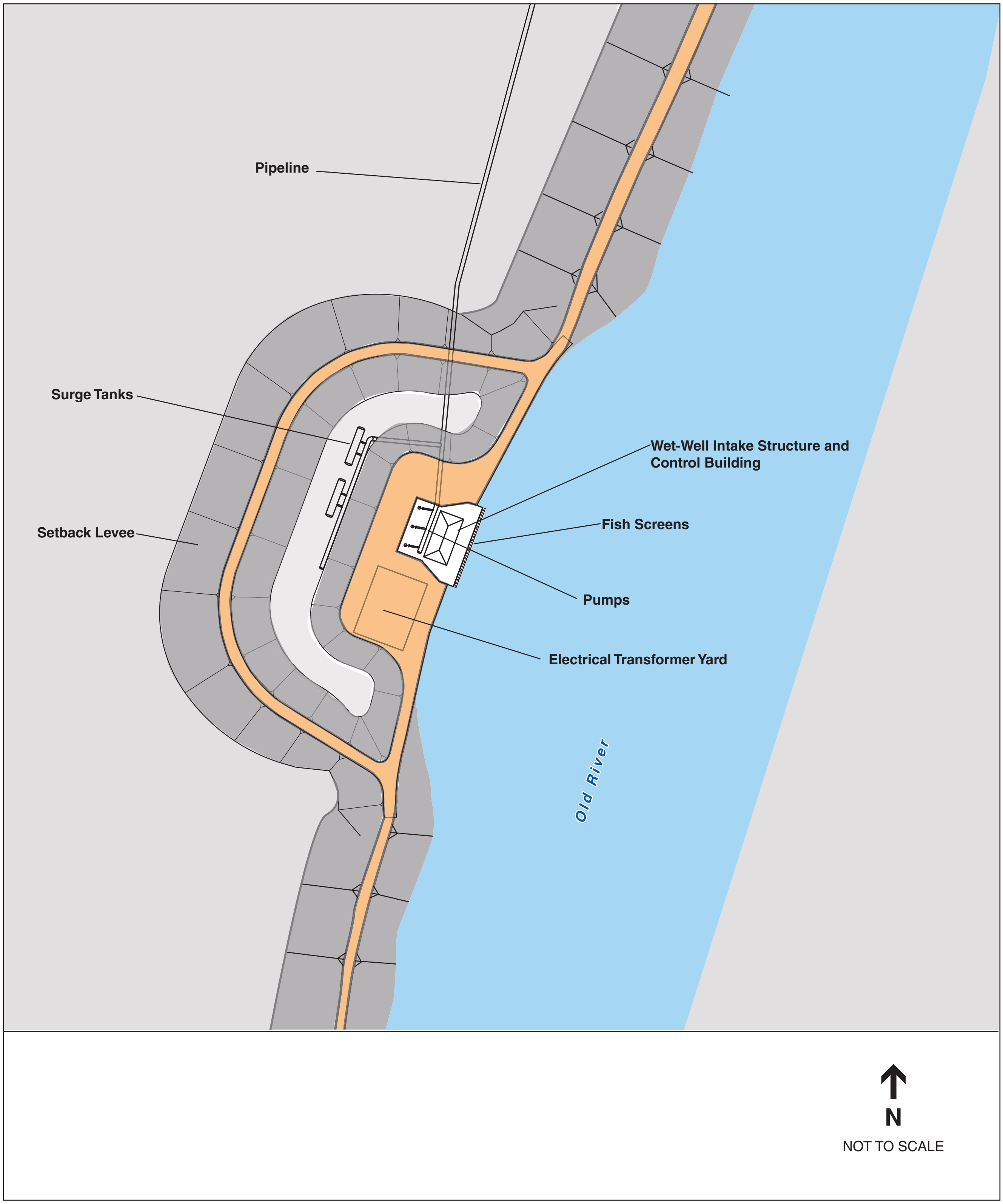
This facility would include a pump station with a capacity to deliver up to 170 cfs (up to five pumps), surge tanks (up to two tanks, 40 feet long), a motor control center building, and an electrical transformer yard. Access to the site would be on existing roads. The facility site would be fenced.

Site Development

The conceptual site design for the new Delta Intake and Pump Station is shown on Figure 3-20. The facility would have a similar design to the existing Old River Intake and Pump Station. The site, now in agricultural use, would be completely cleared prior to construction. The subsurface conditions in the siting zone for the new Delta Intake and Pump Station are expected to be composed of a series of fine sands, silts, clays, and peat that are highly compressible and of low strength. Accordingly, the facility would need to be supported on a foundation system such as driven concrete, steel piles, or stone columns. For purposes of the impact analysis in this Draft EIS/EIR, it is assumed that piles would be driven at an approximate elevation of 50 feet msl and spaced about 15 feet apart on a square grid. In addition to the piles, soil densification would likely be required between the intake and setback levee to reduce the liquefaction potential of the soil and to improve its lateral strength during seismic events. The first step in construction for this facility would be installation of a new setback levee, discussed in the next section. Once the setback levee and site foundation are established, concrete pouring and steel working activities would proceed. The primary building materials would include structural steel, concrete, and masonry. Facilities would include electrical, hydraulic, and mechanical systems. Generally, excavated soils would be stored on site until used in grading or would be immediately removed from the site for reuse or disposal.

Levee Improvements

Construction of levee improvements would occur in two phases. First, an earthen setback levee would be constructed on the landward side of the existing levee. The setback levee would be integrated with the existing levee to provide continuity of the land/water barrier. Construction activities for the new intake would be initiated along the existing levee edge after the setback levee is completed. All new construction for the setback levee would incorporate modern techniques for soil compaction.



SOURCE: URS, 2008; CCWD, 2008; and ESA, 2008

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Figure 3-20
New Delta Intake and Pump Station – Conceptual Layout

The new levee configuration would consist of additional earthen fill placed about 1,000 to 1,200 feet longitudinally and 250 to 300 feet laterally on the land side of the existing levee. Sheet piles would also be longitudinally placed about 350 feet upstream and downstream of the new intake and would be integrated into the new setback levee to serve as a seepage barrier. Slope protection in the form of riprap would be installed on the water side of the existing levee for a distance of about 400 to 500 feet both upstream and downstream of the new intake. The new fill behind the existing levee would be constructed to maintain continuity of the existing road system along the existing levee crest. The elevation along the top of the new embankment fill and the existing embankment at the intake would be raised above the existing levee top elevation to account for anticipated sea level rise due to climate change. Erosion control measures such as hydroseeding would be used on the landward side of the new setback levee.

In-Water Construction Activities

In-water construction activities for installation of the fish screens for the new Delta Intake and Pump Station would be conducted either from a barge or from the top of the levee road. A sheet pile cofferdam would be installed in Old River to isolate the work area from the water and provide a means to conduct construction work in a dewatered environment. If excavation is required to prepare the cofferdam site, this excavated material would be contained within a designated containment area or areas on the land side of the levee. An earthen dike or siltation fences would enclose the containment area(s). Retention of the excavated materials would promote settling of the suspended sediments. After installation of the cofferdam, the water in the cofferdam enclosure would be pumped out and either disposed of on land or treated (as necessary) and discharged back to Old River. For installation of the fish screen, excavation would be required in Old River in an area of about 2,400 square feet to depths within 1 to 2 feet of the existing channel bottom.

Expansion of the Old River Intake and Pump Station (Alternative 3 Only)

Under Alternative 3 only, the existing 250-cfs Old River Intake and Pump Station would be expanded to its buildout capacity of 320 cfs. This would be done by replacing existing pumps with higher horsepower pumps, replacing steel plates in existing unused bays with state-of-the-art positive-barrier fish screens, and installing a second surge tank in the spot reserved for it next to the existing tank. All work would be conducted within the existing facility site. The additional capacity is needed because more water would be pumped to fill the expanded reservoir. There would be no excavation or other earthwork; the existing site is fully paved.

Operation and Maintenance of Intakes and Pump Stations

CCWD currently operates the Old River Intake and Pump Station (and AIP upon completion) remotely from CCWD Control at the Ralph D. Bollman Water Treatment Plant in Concord, but the facilities can be operated on site. The Expanded Old River Intake and Pump Station and new Delta Intake and Pump Station would generally be operated in the same manner. Under Alternatives 1 and 2, all three intakes for the Los Vaqueros Reservoir system could be operated simultaneously for a total combined capacity of up to 670 cfs. Currently, the combined diversion from the Old River

Intake and Pump Station and AIP is limited to 320 cfs by permit conditions. Under Alternatives 1 and 2, the intake operating permits would be modified to allow diversions from these two intakes up to the full 500 cfs capacity. The new Delta Intake and Pump Station would provide the remaining 170 cfs diversion capacity to achieve the full 670 cfs of Delta diversion capacity.

Under Alternative 3, the Expanded Old River Intake and Pump Station and AIP could be operated simultaneously for a total combined capacity of 570 cfs. For Alternative 4, operations of the Old River Intake and Pump Station and the AIP would remain the same, providing for combined diversion of up to 320 cfs.

Maintenance activities would generally include equipment inspections, preventive maintenance, and repair. Water quality monitoring and fish monitoring activities at the existing intakes would be expanded to include the new Delta Intake and Pump Station. Like the existing intakes, the new Delta Intake and Pump Station would be unstaffed and monitored via telemetry as well as through regular inspections.

3.5.3 Conveyance Facilities

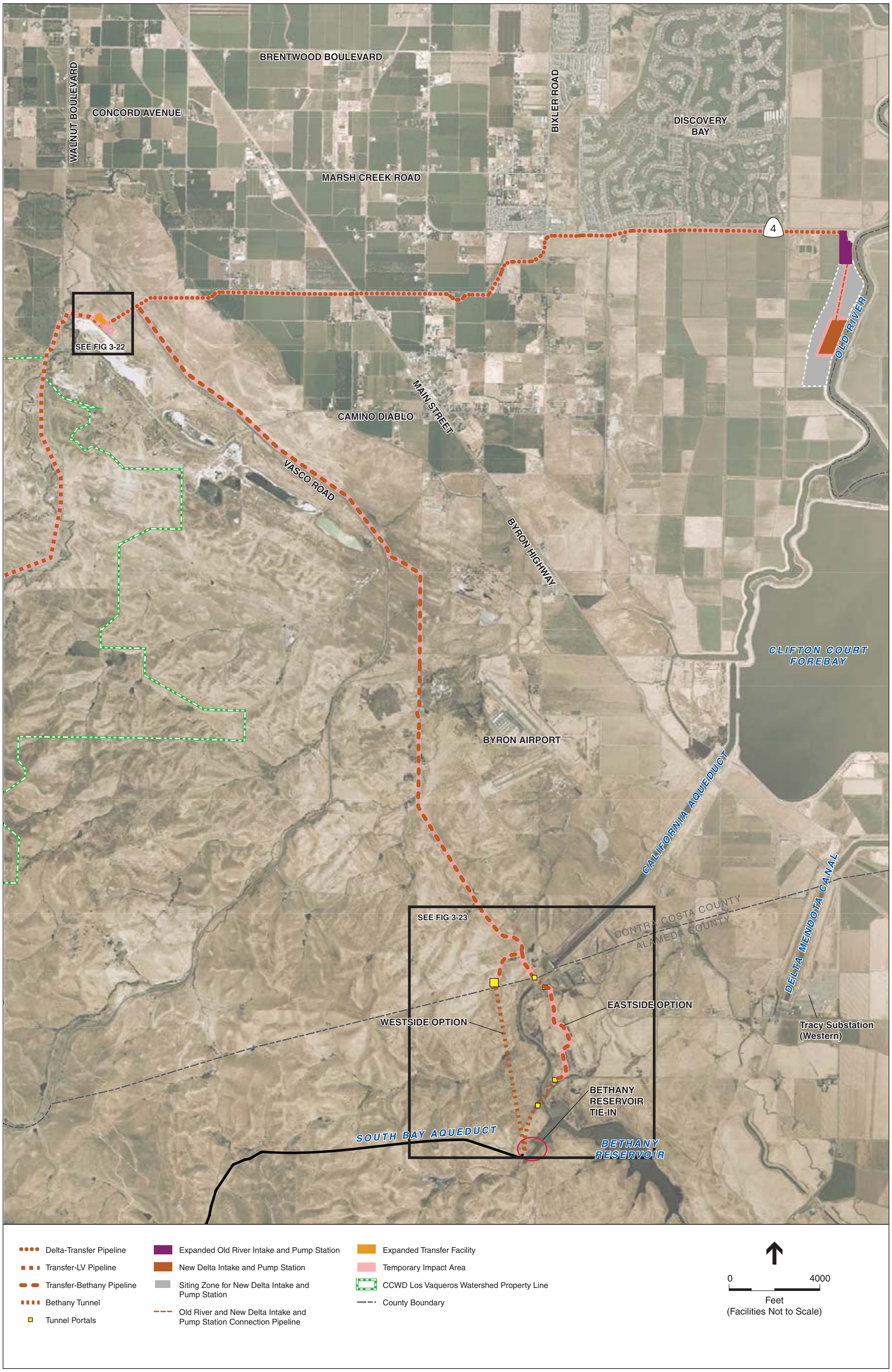
The existing conveyance system that moves water from the Delta to the existing Los Vaqueros Reservoir would be expanded in support of the 275-TAF reservoir under Alternatives 1, 2, and 3. This would involve construction of new pipelines generally parallel to the existing pipelines from the Delta intake to the Transfer Facility and from the Transfer Facility up to the reservoir and capacity expansion at the Transfer Facility. In addition, under Alternatives 1 and 2, a new conveyance pipeline would be constructed to provide a South Bay Connection linking the expanded Los Vaqueros Reservoir system to South Bay water agencies via Bethany Reservoir. Each of these conveyance facility projects is described in the following subsections. **Figure 3-21** presents an overview of the proposed conveyance facilities.

Under Alternative 4, no new conveyance pipelines would be constructed; the existing conveyance system would be used. The existing pumps at the Transfer Facility would be upgraded to provide more power to lift water into the 160-TAF expanded reservoir, but this upgrade would not involve facility or site modification.

The proposed conveyance facilities are described below followed by a discussion of construction activities for these facilities.

Delta-Transfer Pipeline

At present, water is diverted from the Delta at the Old River Intake and Pump Station and conveyed via the Old River Pipeline to the Transfer Facility. The Old River Pipeline generally traverses agricultural fields and orchards as it extends first in a westerly direction from the Old River Intake and Pump Station parallel to State Route 4 to the intersection of Bixler Road, then in a southwesterly direction for about 1 mile before continuing west to the Transfer Facility outside of Byron off Vasco Road. The Old River Pipeline is 34,700 feet long (about 6.5 miles) and 78 inches in diameter with a design capacity of 320 cfs. It is located 50 feet into an 85-foot permanent easement owned by CCWD.



SOURCE: USDA, 2006; and ESA, 2008

Figure 3-21
Overview of Conveyance Facilities

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Under Alternatives 1, 2, and 3, a new pipeline, the Delta-Transfer Pipeline, would be constructed between the new Delta Intake and Pump Station and the Transfer Facility. This pipeline would generally parallel the existing Old River Pipeline alignment within the existing Old River Pipeline permanent right-of-way for most of the route (see Figure 3-21). Under Alternatives 1 and 2, the pipe would be about 38,000 feet long, 96 inches in diameter and would be capable of conveying 350 cfs. Under Alternative 3, the pipeline would be about 34,700 feet long, 78 inches in diameter and would be capable of conveying 250 cfs. The pipeline for Alternatives 1 and 2 is longer than for Alternative 3 because it includes the connecting pipeline from the new Delta Intake and Pump Station to the Old River Intake and Pump Station.

Transfer Facility Expansion or Upgrade

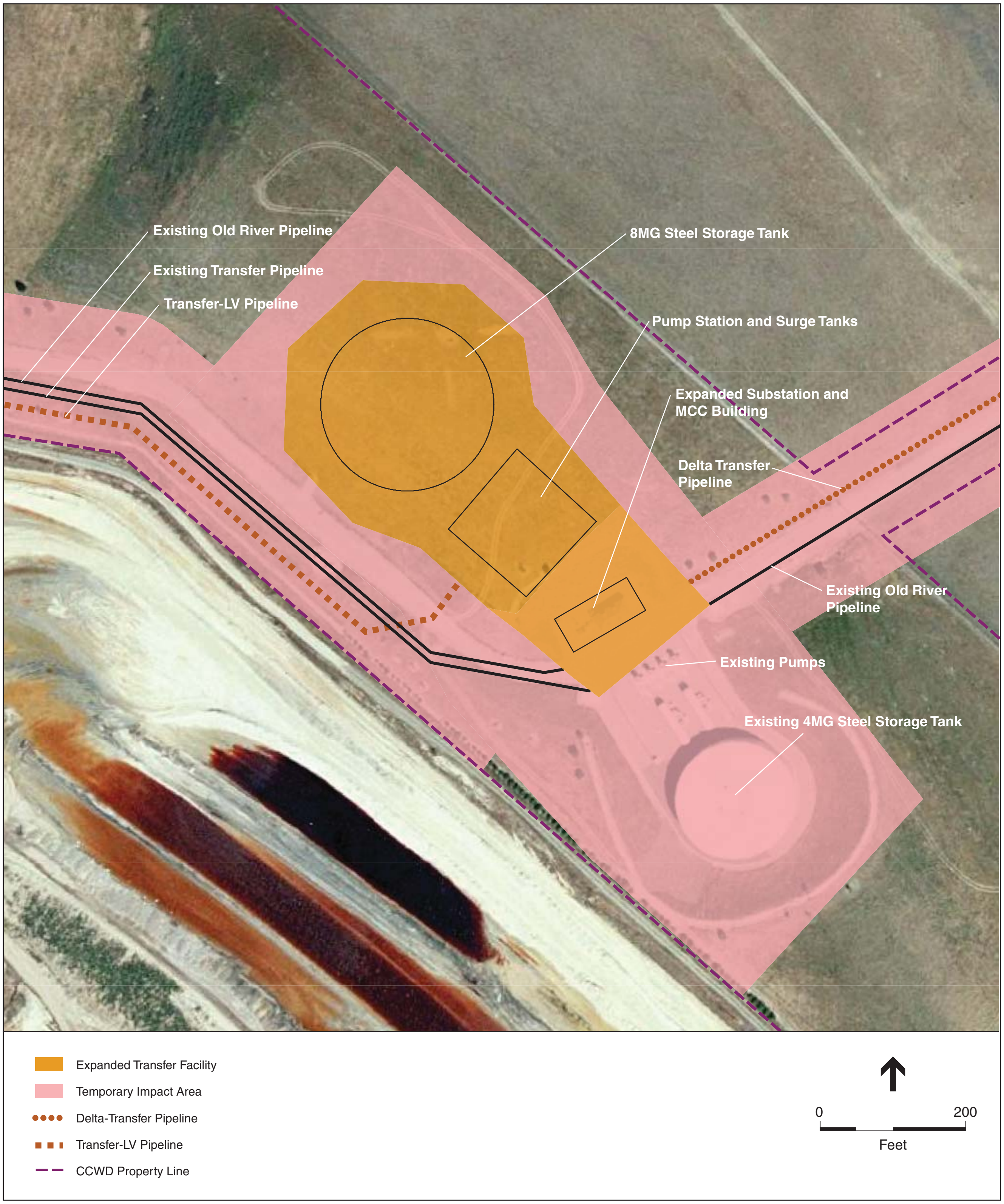
The Transfer Facility is the hub of the Los Vaqueros Reservoir system, regulating flows into and out of the Los Vaqueros Reservoir and into the Contra Costa Canal via the Los Vaqueros Pipeline. The Transfer Facility lifts water from the Old River Pipeline to the Los Vaqueros Reservoir. The existing Transfer Facility is on a fenced 24.3-acre site and is composed of a 4-MG steel storage tank, four 2,100-horsepower pumps capable of delivering 200 cfs up to the reservoir, a motor control building, and transformer yard. A flow control station is located outside this site adjacent to the Los Vaqueros Pipeline. The facility is about 2.75 miles west of Byron on Vasco Road between Camino Diablo and Walnut Boulevard. The steel storage tank is a reservoir to balance water movement through the system as operations change to allow reservoir filling and/or releases.

Alternatives 1, 2, and 3 would require expansion of the Transfer Facility to provide the capacity to move additional water to the expanded, higher reservoir. Under Alternatives 1 and 2, the existing 200 cfs capacity at the Transfer Facility would be expanded by 470 cfs for a total pumping capacity of 670 cfs. Under Alternative 3, capacity would be expanded by 370 cfs for a total pumping capacity of 570 cfs.

Expansion of this facility under Alternatives 1 through 3 would involve construction of a new pump station and modification of the existing pump station, an additional 8-MG steel storage tank to provide a total of 12 MG of storage, new surge tanks, and expansion of the existing motor control center building and transformer yard. The new facilities would be on the northern portion of CCWD-owned property, adjacent to the existing Transfer Facility, as shown on **Figure 3-22**.

For Alternatives 1, 2, and 3, about 270,000 cubic yards of material would need to be excavated for the new steel storage tank at the Transfer Facility. Concrete pouring and steel working activities would occur simultaneously with general construction activities for each new facility. The primary building materials would include structural steel, concrete, and masonry. Facilities would include electrical, hydraulic, and mechanical systems. Generally, excavated soils would be stored on site until used in grading or would be immediately removed from the site.

Under Alternative 4, there would be no new facilities, but the existing pumps would be upgraded to retain the current pumping capacity under the higher head of the expanded Los Vaqueros Reservoir. The upgrades would consist primarily of changing out electric pump motors and modifying the pumps. All work would be done within the existing footprint of the Transfer Facility.



SOURCE: GlobeXplorer, 2007; and ESA, 2008

Figure 3-22
Expanded Transfer Facility

Transfer-LV Pipeline

At present, water is conveyed from the Transfer Facility either under gravity to the Contra Costa Canal via the Los Vaqueros Pipeline or pumped up to the Los Vaqueros Reservoir via the Transfer Pipeline. The Transfer Pipeline generally parallels an internal road at the Transfer Facility until it intersects with Walnut Boulevard, at which point the alignment continues south, paralleling Walnut Boulevard through the Kellogg Creek Valley, and continuing into the watershed until it connects to the inlet and outlet pipelines near the dam. The Transfer Pipeline is about 19,600 feet long (about 3.7 miles) and 72 inches in diameter. The Transfer Pipeline conveys water at a rate of up to 200 cfs from the Transfer Facility pumps to the Los Vaqueros Reservoir, and at a rate of up to 400 cfs from the Los Vaqueros Reservoir to the flow control station west of the Transfer Facility, then on to the Contra Costa Canal through the Los Vaqueros Pipeline. The Transfer Pipeline is located 50 feet into an 85-foot permanent easement (see Figure 3-21).

Under Alternatives 1, 2, and 3, an additional pipeline, the Transfer-LV Pipeline, would be installed to convey up to 670 cfs (570 cfs with Alternative 3) from the Transfer Facility to the expanded Los Vaqueros Reservoir and would also be used for release flows. The existing Transfer Pipeline would be used for releases only and would retain its existing capacity of up to 400 cfs. Additional filling capacity in this part of the conveyance system is needed because filling the larger reservoir during the limited period when water quality is sufficient requires a greater rate of flow than the current Transfer pumps and pipeline can deliver. Under Alternatives 1 and 2, the Transfer-LV Pipeline would be connected to the Transfer-Bethany Pipeline at the expanded Transfer Facility and used to convey water under gravity from the expanded Los Vaqueros Reservoir to Bethany Reservoir.

The new Transfer-LV Pipeline would generally parallel the existing Transfer Pipeline alignment (see Figure 3-21) within the existing Transfer Pipeline permanent easement right-of-way for a majority of the route. Under Alternatives 1 and 2, the additional pipeline could be up to 132 inches in diameter. Under Alternative 3, the new pipeline could be up to 120 inches in diameter.

Under Alternatives 1 and 2, energy recovery facilities would be constructed at the Expanded Transfer Facility to capture the excess energy generated when water is released from the expanded Los Vaqueros Reservoir and delivered to Bethany Reservoir via the Transfer-LV and Transfer-Bethany Pipelines.

Transfer-Bethany Pipeline (South Bay Connection)

Pipeline

The Transfer-Bethany Pipeline, a component of the South Bay Connection, would be a new pipeline constructed under Alternatives 1 and 2. The pipeline would connect with both the Delta-Transfer Pipeline and the Transfer Pipeline within the Transfer Facility site; however, the Transfer-Bethany Pipeline would not connect to the Transfer Facility itself (i.e., to the pumps or steel storage tanks). The Transfer-Bethany Pipeline would be as long as 8.9 miles (about 47,000 feet), up to 132 inches in diameter, and connected to the Delta-Transfer and Old River Pipelines at a point just east of the Transfer Facility. It would have the capacity to convey up to

470 cfs. Water would be conveyed through the Transfer-Bethany Pipeline to Bethany Reservoir for delivery to South Bay water agencies in one of the following three ways:

1. Water could be pumped from the Delta intakes (a combination of the new Delta Intake and Pump Station, Old River Intake and Pump Station, and/or AIP) to the Bethany Reservoir through the Old River and Delta-Transfer Pipelines to the Transfer-Bethany Pipeline.

2. Water could be released under gravity from the Expanded Los Vaqueros Reservoir to the Bethany Reservoir through the Transfer-LV Pipeline to the Transfer-Bethany Pipeline.

3. Water delivered via the Transfer-Bethany Pipeline could be a combination of water directly diverted from the Delta intake facilities and water released from the Expanded Los Vaqueros Reservoir.

From Bethany Reservoir, water delivered from the Expanded Los Vaqueros Reservoir could either be pumped into the SBA via the South Bay Pumping Plant, or could be transferred through the California Aqueduct (connected to the southern end of Bethany Reservoir) to the San Luis Reservoir for delivery to SCVWD, which obtains its CVP water through San Luis Reservoir.

As shown on Figure 3-21, the Transfer-Bethany Pipeline would start on the eastern side of Vasco Road near the Expanded Transfer Facility with a connection to the Delta-Transfer Pipeline and extend approximately 8.5 to 8.9 miles southeast to Bethany Reservoir. The alignment would extend southeast generally parallel to Vasco Road for about 3.9 miles to the corner of where Armstrong Road turns south. The pipeline would continue south along Armstrong Road for about 1.3 miles and then traverse southeast overland approximately 1.5 miles to a point close to the California Aqueduct. At this point, there are two options for the final southern segment of the pipeline to the Bethany Reservoir Tie-in: a Westside Option and an Eastside Option. As described below, both of these options include tunnel segments (see **Figure 3-23**).

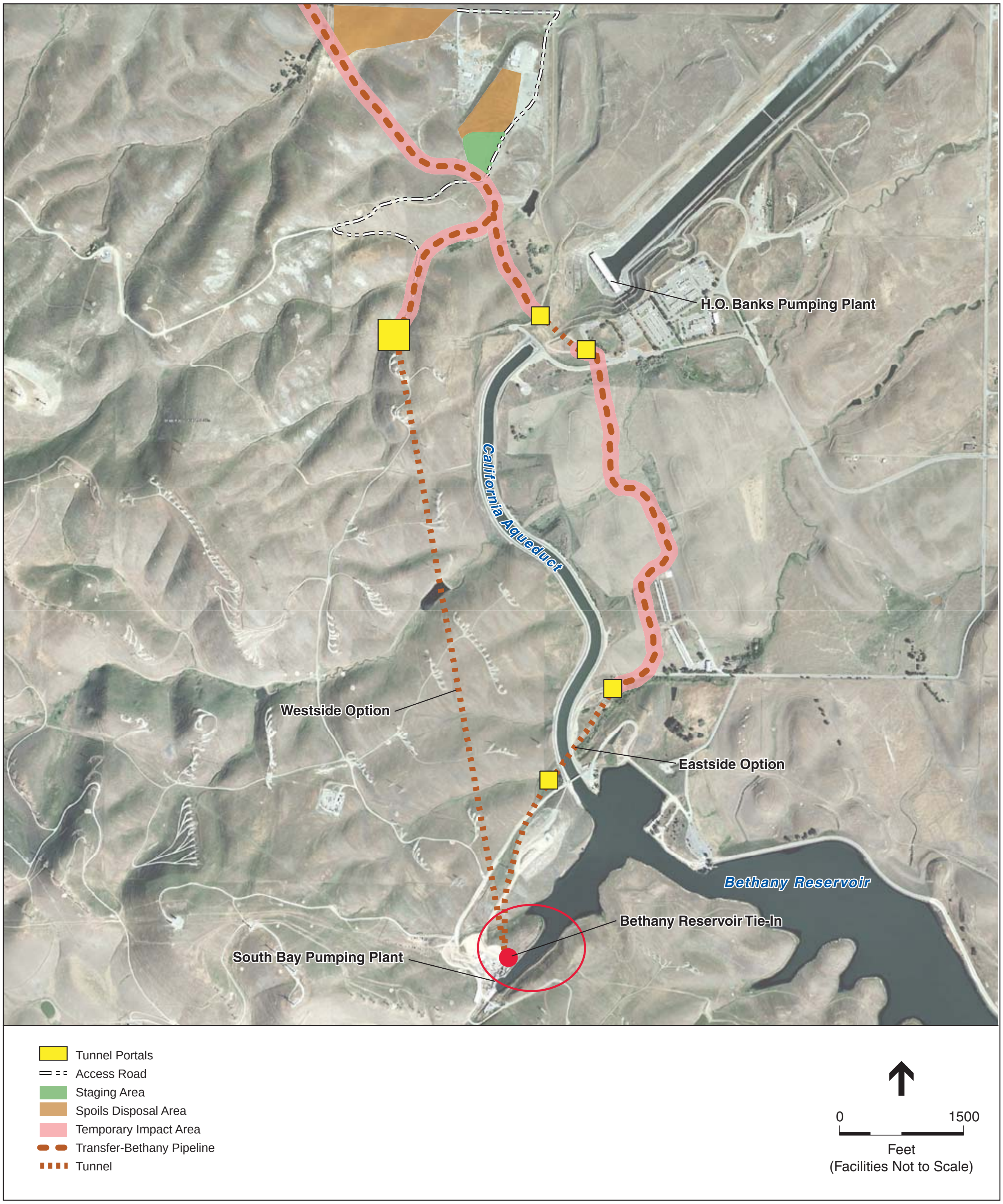
1. Westside Option (about 1.8 miles): the pipeline would continue an additional 0.4 mile south and then would be tunneled the last 1.4 miles to the Bethany Reservoir Tie-in. Tunneling this last segment would deal with the hilly terrain and maintain gravity flow to the Bethany Reservoir Tie-in.

2. Eastside Option (about 2.2 miles): the pipeline would continue about 0.4 mile towards the Banks Pumping Plant, then tunnel about 0.1 mile under the California Aqueduct, traverse south toward Bethany Reservoir for about 1.0 mile, to a final tunnel segment, about 0.7 mile, under the California Aqueduct to the Bethany Reservoir Tie-in.

Bethany Reservoir Tie-in

The South Bay Connection at Bethany Reservoir would include either an above-reservoir connection or a submerged connection.

With an above-reservoir connection, the tunnel section at the end of the Transfer-Bethany Pipeline would terminate at a portal on the slope above the Bethany Reservoir. A reinforced concrete energy-dissipating structure would be constructed from the portal down into the reservoir.



SOURCE: GlobeXplorer 2007; and ESA, 2008

Figure 3-23
Transfer-Bethany Pipeline
Alignment Detail

A section of the shore would need to be temporarily isolated behind a cofferdam to allow the dissipating structure to be completed below the reservoir surface. Construction at the reservoir could take up to one year to complete.

A submerged connection would include a vertical steel-lined shaft connecting the reservoir floor with the underlying Transfer-Bethany Pipeline tunnel. A barge and/or fixed platform installed in the water over the connection location would be used to drill the shaft and install the steel liner. To minimize impacts to water quality, a silt curtain and/or other measures would be used during in-water construction activities. The base of the steel liner would be closed off with removable bulkheads and the liner would be flooded to facilitate installation within the shaft. The liner would be secured to the shaft using concrete. Once the steel liner is in place, the tunnel would be mined to beneath the shaft and a permanent connection established. The tunnel would be flooded to equalize the pressure between the tunnel and steel-lined shaft, after which divers would remove the shaft bulkheads completing the connection to the Bethany Reservoir. Construction at the reservoir could take up to six months to complete.

Blow-Off and Air Valves – All Pipelines

Blow-off and air valves would be installed along the new pipelines proposed under Alternatives 1, 2, and 3. Blow-off valves and air valves are permanent release valves for water and air, respectively, used during pipeline filling and draining and during routine operations. Blow-off valves and air valves are installed at low points and high points, respectively. The actual locations of these valves would depend on the pipeline alignment; however, for purposes of this analysis, it is reasonable to assume that one air valve would be installed about every 1,000 feet and one blow-off valve every 2,000 feet. The valve structures have a concrete base with a medium diameter pipe extending about 2 feet above the base for a total height of about 2 to 4 feet above the ground. **Figure 3-24** shows an existing air release valve on the Old River Pipeline that is typical of what the new valve structures would look like.

Construction

Pipelines

Project pipelines would be constructed throughout the full 36-month estimated project construction period. However, any given segment of pipeline would be in active construction for a much more limited period. For purposes of the impact analysis in this document, it is assumed that pipeline construction proceeds at a pace of about 120 feet per day for open trench construction and at a reduced pace for tunneling or boring and jacking.

The temporary construction easement for the Delta-Transfer Pipeline and the Transfer-LV Pipeline was assumed to be 200 feet wide, and the Transfer-Bethany Pipeline to be 300 feet wide for purposes of environmental impact analysis. The actual construction area used would be narrower in some places due to environmental constraints (e.g., to avoid wetlands), physical conditions, or landowner issues. The minimum right-of-way for construction would be 85 feet wide, except on the Transfer-Bethany Pipeline along Armstrong Road where the work area could be restricted further to minimize impacts to vernal pool fairy shrimp habitat.

SOURCE: CCWD, 2008

Figure 3-24
Existing Valve Structure

Pipeline materials (e.g., piping, backfill material) would be stored along the pipeline route within the construction easement. The active work area would generally be 25 to 50 feet on both sides of the trench.

Where either the Delta-Transfer Pipeline or Transfer-LV Pipeline is installed within the existing permanent right-of-way for the Old River Pipeline or Transfer Pipeline, respectively, an additional permanent easement would not be necessary. Where these pipelines are not within that existing easement area, a new permanent 85-foot-wide easement would be acquired. For the new Transfer-Bethany Pipeline, it is assumed that CCWD would acquire a permanent 85-foot-wide easement.

Open-trench construction methods would be used for most pipeline installation, and bore-and-jack methods would be used for crossings where trenching methods are not feasible or where restrictions warrant other construction methods (e.g., major roadways and intersections, railroad lines, flood control channels). The as-built surface elevation would generally match the original ground surface elevation. **Figure 3-25** shows a schematic view of pipeline construction activities.

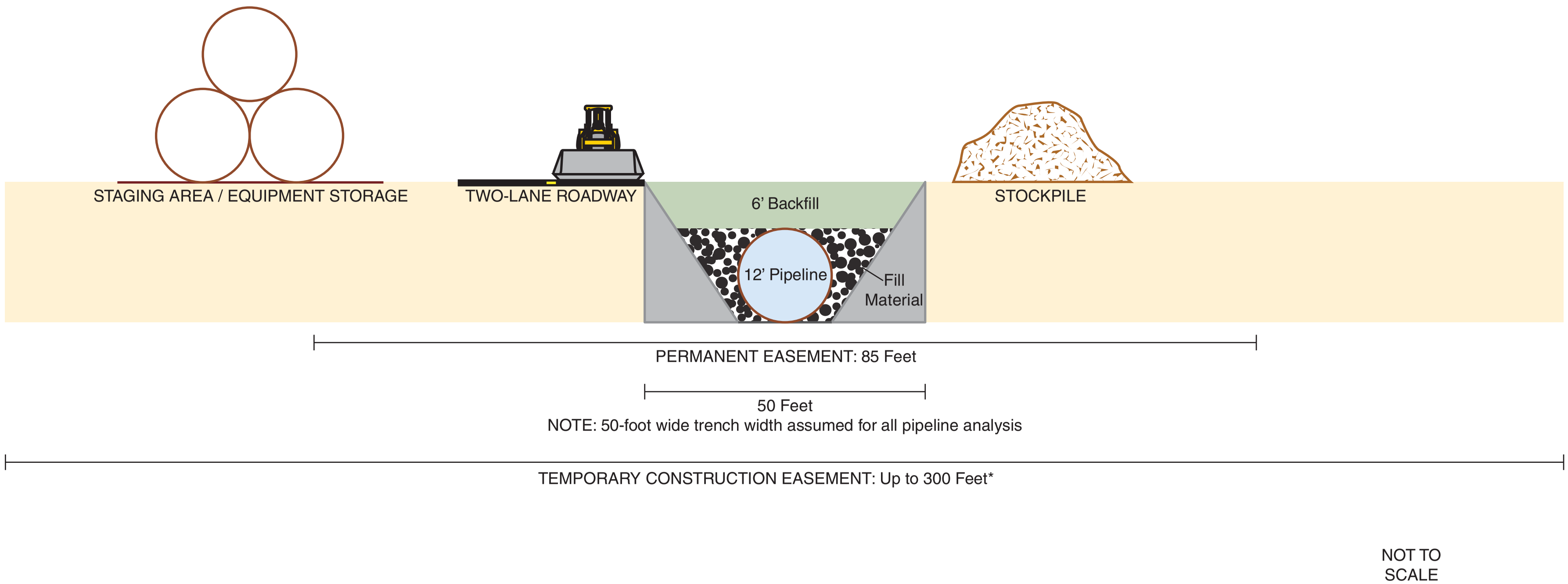
Open Trench

The trench width for the conveyance pipeline installation would range from 35 to 70 feet; trench depth would range from 15 to 55 feet, depending on the size of the pipeline being installed but would typically be 20 feet. Where required for safety, trenches would be braced with a trench box or shoring. The active work area along the open trench would generally extend about 25 to 50 feet to both sides of the trench. The construction right-of-way would range from about 85 feet to 200 feet wide.

Staging areas would be set up along the pipeline alignment, and construction equipment and other materials would be located at selected locations to facilitate the movement of materials, equipment, and construction crews. Staging areas would be selected to minimize hauling distances and long-term disruption and avoid sensitive environmental resources that may be present. Imported backfill would be delivered to stockpiles near the open trench. When the new pipeline is in place, backfill would be placed in the trench. Minimum soil coverage is generally about 5 to 6 feet.

Boring and Jacking

Bore-and-jack construction techniques may be used at some locations to avoid significant impacts such as at crossings of flood control channels, major roadways, railroads, wetlands, and other environmentally sensitive locations including known cultural resources within the Delta-Transfer pipeline corridor. The bore-and-jack method involves using a horizontal boring machine or auger to drill a hole and a hydraulic jack to push a casing through the hole. As the boring proceeds, a steel casing pipe is jacked into the hole; the pipeline is then installed in the casing. The casing is pushed using a large hydraulic jack in a pit at one end of the crossing. In some cases, the pits would extend below the water table, requiring the use of sheetpiles and dewatering pumps. Bore-and-jack undercrossings below the water table would require enclosure of the jacking pits with sheetpiles and special bulkheads at the jacking portals. Water from dewatering operations would be disposed of in accordance with applicable state and local requirements.



* 300 feet for Transfer-Bethany Pipeline only
Up to 200 feet for Delta-Transfer and Transfer-LV Pipelines

SOURCE: ESA, 2008

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Figure 3-25
Pipeline Construction Schematic

Dewatering

Dewatering during pipeline construction would be accomplished with a trench sump and an engine-driven dewatering pump on an as-needed basis, depending on groundwater conditions during construction. Pit sumps, groundwater wells, or a combination of both may be used to dewater the excavation. The water would be disposed of in accordance with applicable requirements.

If needed for the operation of pipeline sending and receiving pits, dewatering wells may be constructed to adequately dewater the construction area. Groundwater would be treated similarly to that encountered during open-trench construction. Post-construction, the dewatering wells would be capped and abandoned in compliance with applicable requirements.

Tunneling

For the Westside Option of the Transfer-Bethany Pipeline, the approximate location of the tunnel entry portal would be at the Alameda County line. The pipeline would be tunneled directly to the Bethany Reservoir Tie-in, either to an exit portal above Bethany Reservoir for the above-reservoir connection or into Bethany Reservoir for the submerged connection. See Figure 3-23. The tunnel entry portal site would be about 3 acres. Access to the site would be via an existing gravel road, about 35 feet wide, which begins at the terminus of Byron Hot Springs Road and heads south past a large gravel pad before it traverses westward. Approximately 2,000 feet past the existing gravel pad, the access road makes a hairpin turn and traverses down a hill. From the bottom of the hill, a new 1,150-foot long temporary access road would be installed to the entry portal site. The existing access road may need to be widened in some locations to maintain a 35-foot width. Access to the site of the Bethany Reservoir Tie-in would be via existing access roads in and around the Bethany Reservoir.

For the Eastside Option, the pipeline would include two short tunnel segments under the California Aqueduct. Access to the tunnel portals would be via existing roads. Modification/widening of these roads might be required.

The 12-foot tunnels would be constructed using a tunnel-boring machine, road-header machine, or conventional drill and blast methods. Diesel generators would be required. For the Eastside Option, the northern 700-foot-long tunnel entry and exit portals would be approximately 1,800 square feet (i.e., 30 by 60 feet). For the southern, approximately 4,000-foot-long tunnel, the exit portal, on the eastern side of the California Aqueduct would be approximately 1,800 square feet (i.e., 30 by 60 feet); however, the entry portal area would be approximately 1 acre to accommodate the tunnel boring, excavation equipment, pipeline and materials storage, pipeline connectors, and temporary parking for crews, trucks, and other requirements.

The construction of the Westside Option would create up to 60,000 cubic yards of waste rock and tunnel spoils, and the Eastside Option would create about 35,000 cubic yards of waste rock and tunnel spoils. The spoils would be hauled from the tunnel face for temporary onsite storage and/or subsequent, final disposal. Larger waste rock and tunnel muck would be disposed at three potential locations: at two designated disposal areas occupying up to 22 acres near the terminus of Byron Hot Springs Road or along project access roads where it would be consolidated and used as a roadway sub-base or surface. Assuming an average depth of 3 feet, the tunnel spoils could be used for roadway sub-base on about 50,000 feet of project access road.

The designated disposal area would be designed to promote surface water drainage and minimize ponding or standing water. Soil would be imported or retained during site excavation to cap the tunnel spoils and promote revegetation.

Staging and Disposal Areas. An approximately 4.5-acre existing gravel pad near the terminus of Byron Hot Springs Road would be used as a staging area for the trench and tunnel activities under either option. The site would be used to accommodate the tunnel excavation equipment, pipeline, and other materials storage as well as temporary parking for crews, trucks, and other equipment. Two spoil disposal areas, totaling approximately 22 acres, have been sited near the terminus of Byron Hot Springs Road for disposal of tunnel waste rock and spoils.

Operation and Maintenance of Conveyance Facilities

The conveyance facilities would normally be operated remotely from CCWD Control at the Ralph D. Bollman Water Treatment Plant although the pumps, valves, and blow-offs could be operated manually as well. Maintenance activities include routine inspection of pipelines and other equipment, preventive maintenance, and repairs.

3.5.4 Power Supply Infrastructure

Under Alternatives 1, 2, and 3, expansion of the Los Vaqueros Reservoir system would require additional electrical power supply. Alternative 4 would not require additional power supply.

CCWD’s existing Old River Intake and Pump Station and the AIP receive power supply from Western. Western owns a double-circuit, 230-kV transmission line that extends from its Tracy substation adjacent to the CVP’s Jones Pumping Plant facilities, into the project area. Western is currently operating the 230-kV line at 69 kV. This existing transmission line runs parallel to two PG&E 500-kV circuits. CCWD’s existing Transfer Facility receives electrical power supply from PG&E via an existing 230-kV transmission line that extends from the PG&E Brentwood Substation.

The existing infrastructure supplying power to the Old River Intake and Pump Station and AIP has insufficient capacity to meet the peak power needed at the new Delta Intake and Pump Station under Alternatives 1 and 2, or at the Expanded Old River Intake and Pump Station under Alternative 3. Additionally, based on preliminary discussions with PG&E, it is anticipated that the Brentwood Substation would be unable to meet the increased peak power loads for the Expanded Transfer Facility under Alternatives 1, 2, and 3. Two options have been identified for constructing power infrastructure to provide additional power supply to these facilities for Alternatives 1, 2, and 3.

Power Option 1: Western Only

Under this option, Western would provide all the additional electrical power required for the expanded Los Vaqueros Reservoir system. For Alternatives 1 and 2, Western would supply additional power to both the new Delta Intake and Pump Station and the Expanded Transfer Facility. For Alternative 3, Western would supply additional power to both the Expanded Old River Intake and Pump Station and the Expanded Transfer Facility.

Delta Intakes

Western would use its existing 230-kV transmission line from the Tracy substation to supply power to a new substation. The new substation site would require approximately 2 acres near the terminus of Camino Diablo Road and would need to have the capacity to step power down from 230 kV to 69 kV and 21 kV. The exact location for the new substation has not been determined; therefore, a siting zone has been defined for purposes of this impacts analysis. **Figure 3-26** shows the proposed alignment and substation site for the power supply option. It is assumed that permanent impacts would not exceed 2 acres for the facility and that a permanent access road to the facility most likely from Camino Diablo Road or another auxiliary road would be required. Landscaping, lighting, and site security plans would be developed and implemented consistent with Western's requirements.

From the new substation, the existing single-circuit, 69-kV powerline to the Old River Intake and Pump Station would be upgraded, replaced, or have an additional line added by one of the following methods: (1) placing new insulator arms and adding a second 69-kV circuit on the existing poles; (2) replacing the existing pole with a new pole to accommodate a double-circuit, 69-kV line; or (3) installing a new 69-kV line parallel to the existing line.

Expanded Transfer Facility

For the Expanded Transfer Facility, a new 21-kV distribution line would be installed from the new substation, paralleling the existing 230-kV transmission line until it intersects with the Delta-Transfer Pipeline alignment. At that point, the new powerline would head westward, generally traversing the same alignment as the Delta-Transfer Pipeline to the Expanded Transfer Facility. For new 69-kV circuits and 21-kV distribution circuits, it is assumed that if new poles are required, they would be about 50 feet tall and installed in up to 300-foot spans.

Power Option 2: Western & PG&E

Under this power option, Western would provide the additional electrical power supply for either the new Delta Intake and Pump Station (Alternatives 1 and 2) or the Expanded Old River Pump Station (Alternative 3), but PG&E would provide the additional electrical power supply to the Expanded Transfer Facility (Alternatives 1, 2, and 3) (see **Figure 3-27**).

Delta Intakes

Western would use its existing 230-kV transmission line corridor from the Tracy substation to supply power to the Delta intakes by constructing a single-circuit, 69-kV powerline to the terminus

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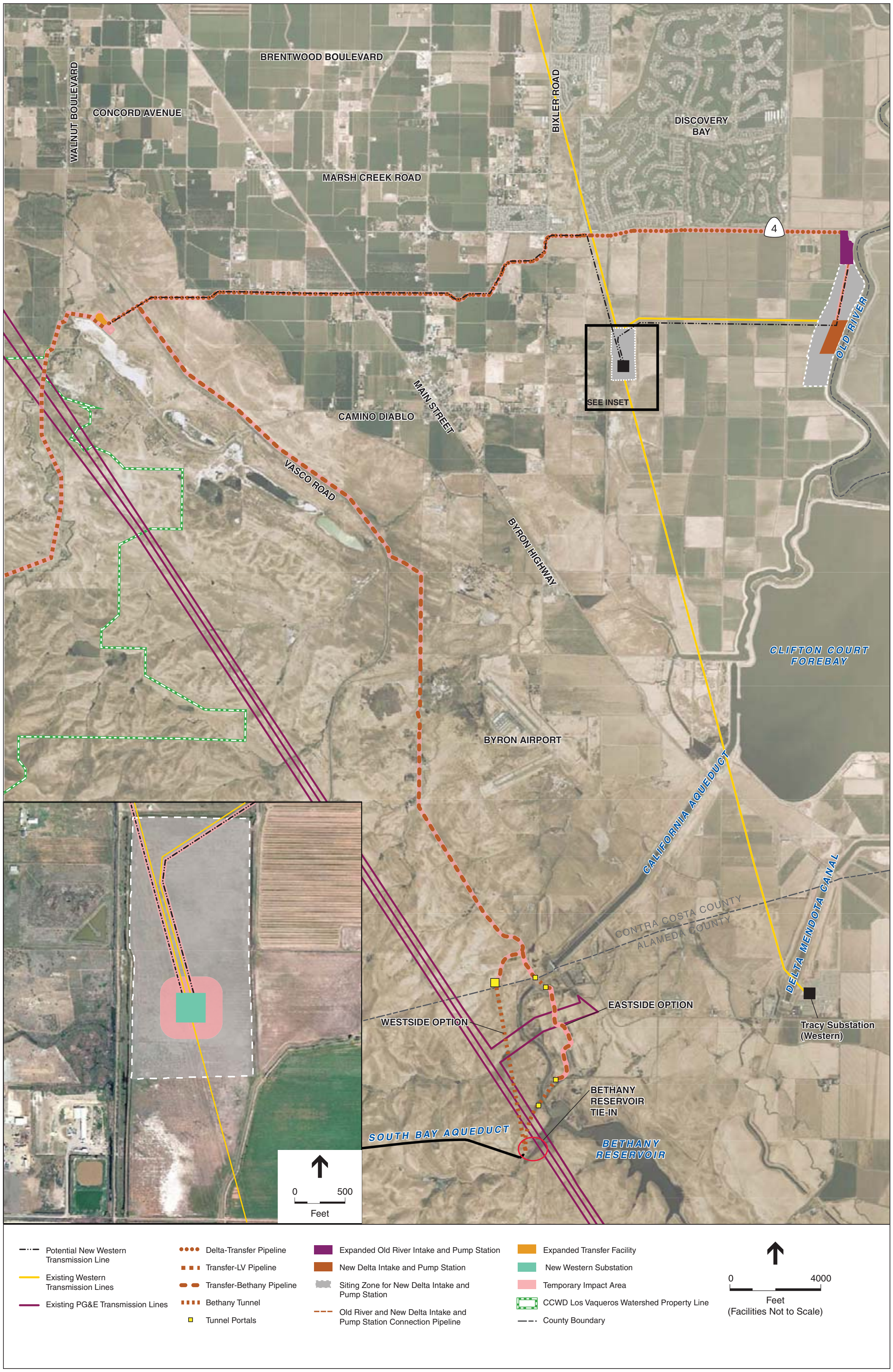
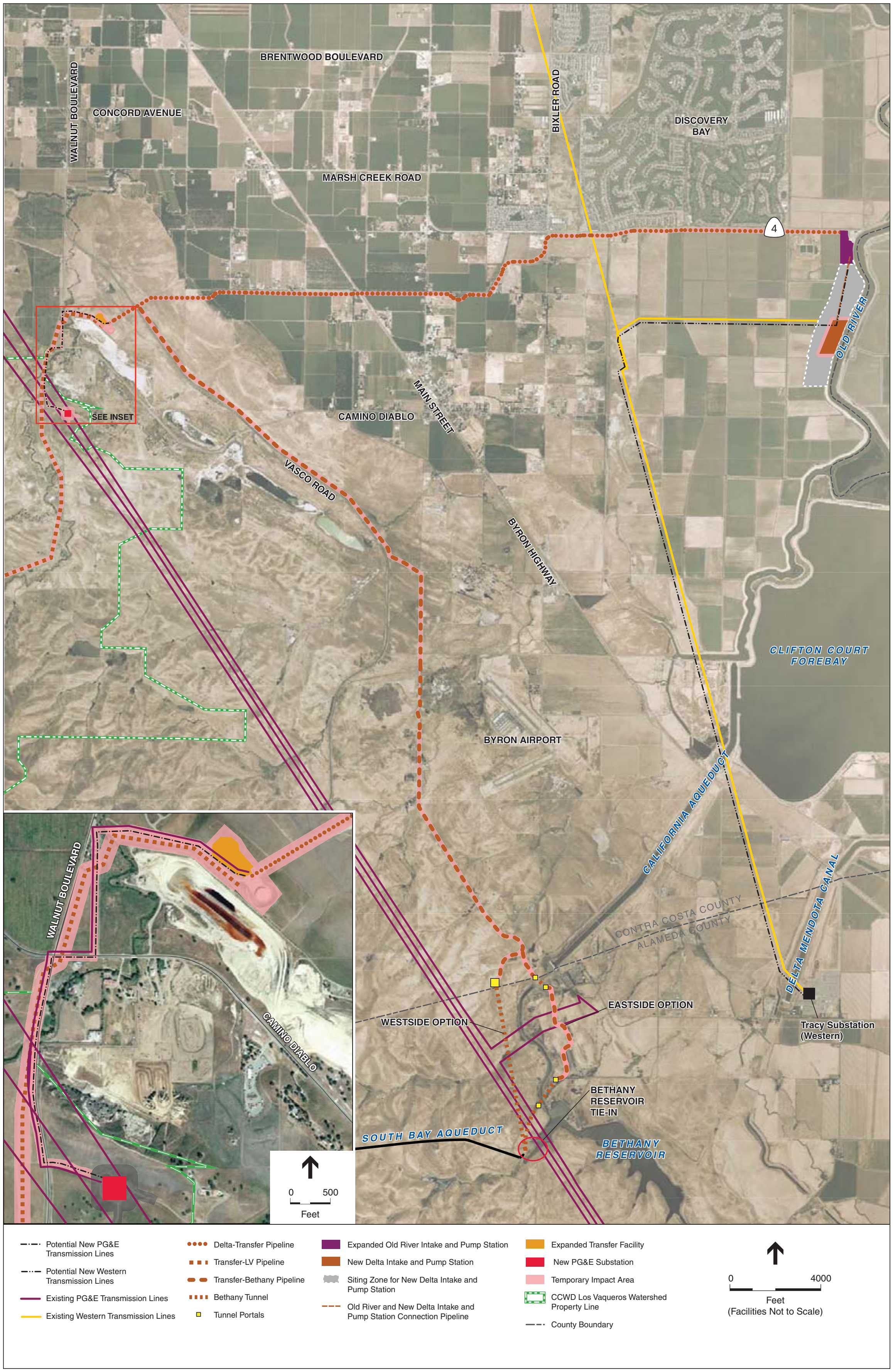


SOURCE: USDA, 2006; and ESA, 2008

Figure 3-26
Power Supply Option 1 –
Western Only



SOURCE: USDA, 2006; and ESA, 2008

Figure 3-27
Power Supply Option 2 –
PG&E and Western

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of the existing single-circuit, 69-kV line that currently supplies power to the Old River Intake and Pump Station. From that point, the existing single-circuit, 69-kV powerline would be upgraded, replaced, or have an additional line added by one of the following methods: (1) placing new insulator arms and adding a second 69-kV circuit on the existing poles; (2) replacing the existing pole with a new pole to accommodate a double-circuit, 69-kV line; or (3) installing a new 69-kV line parallel to the existing line. There would be no new Western substation under Power Option 2.

Expanded Transfer Facility

PG&E would provide power to the Expanded Transfer Facility through a new PG&E distribution substation constructed in the Los Vaqueros Watershed, as shown on Figure 3-27. The new substation would have the capacity to step power down from the existing 230-kV PG&E transmission line to a 21-kV powerline. The substation would require about 2 acres and would be enclosed with fencing. The tallest element, the powerline poles, would be about 50 feet tall. The site for this new substation was selected to minimize visual impacts by using natural topography to obscure views of the facility, creating visual screening. A landscaping plan to provide additional visual screening and a lighting plan to provide security and exterior lighting would also be developed.

The approximately 1.5-mile-long distribution line would begin at the proposed 230-kV PG&E substation about 2,600 feet south of the intersection of Walnut Boulevard and Camino Diablo Road. It would follow the route of PG&E's existing 21-kV distribution line serving the Transfer Facility, which runs west, crosses Walnut Boulevard, heads north paralleling Walnut Boulevard to the intersection of Camino Diablo Road, crosses Walnut Boulevard and traverses east on the south side of Camino Diablo, crosses Camino Diablo Road and traverses north on the west side of Longwell Avenue, crosses Kellogg Creek and traverses on the north side of an existing access road on the Expanded Transfer Facility property. This alignment is shown in the inset on Figure 3-27.

The existing 21-kV distribution line described in the preceding paragraph would be upgraded by one of the following methods: (1) placement of new insulator arms and additional conductors on the existing poles; (2) pole for pole replacement of the existing distribution line and co-location of existing distribution on the new poles; or (3) installation of a new distribution line paralleling the existing distribution line. If new poles were required, they would be about 50 feet tall and installed in increments of 200 to 300 feet apart.

Construction

For purposes of this Draft EIS/EIR, construction impacts for the proposed power/distribution line were based on installation of new 18-inch poles, disposal of old poles and the siting of the new alignment parallel to an existing alignment to fully encompass the maximum ground disturbance, waste disposal, and visual impacts anticipated.

For both the proposed Western power facilities and the PG&E power facilities, access to and from the power/distribution line corridors and substation locations would generally be from existing roadways within the project area. Depending on the final site locations for the substations, some overland access may be required.

Power/Distribution Lines

Typical construction sequencing for both the Western powerline and the PG&E distribution line would include vegetation removal at the pole site, auguring the pole holes, setting the framed poles, backfilling as necessary, and stringing the overhead distribution lines. Pole removal would consist of loosening, removing, and disposing of the pole in accordance with Contra Costa County regulations.

Installation of the conductors would require pull and tension sites as well as work areas within the construction corridor and/or right of way. Pull and tension sites could temporarily disturb approximately 6,250 square feet per site (assumed 125 feet by 50 feet). Pull and tension sites would be sited during final design. They would be within the exiting right-of-way, would be sited to avoid sensitive resources, and would be restored to preconstruction conditions at the commencement of construction. Work areas would be limited to 25 feet on either side of centerline for installation of the new power/distribution line and would also be sited to avoid sensitive resources.

Substations

Typical construction methods for the proposed substations would include vegetation removal, grading, excavation, and construction of subsurface footings and concrete slabs for aboveground structure and equipment. Aboveground structures, including steel bus support racks, high voltage breakers, power transformers, and switchgear and communication equipment would be installed.

Construction Workforce and Schedule

Construction would require several work crews, including Western and/or PG&E personnel as well as contracted construction personnel. The total number of construction crew members is estimated to be up to 25. It is expected that crews would work concurrently; however, the actual deployment of crews depends on the timing of project approval and other factors. The construction period would last about eight to ten months for either substation and about three to six months for the distribution line.

Operations and Maintenance of Power Facilities

The proposed electrical power facilities would be controlled by PG&E and/or Western, as appropriate. A control center in the vicinity of the project would control operations remotely via station and line alarms connected by phone line. Western and/or PG&E would conduct regular and or emergency inspection of their electric lines, support systems, and instrumentation and controls. Trimming of landscaping trees would be conducted in accordance with Western Orders or the California Public Utilities Commission General Order 95, as appropriate. For the proposed substation facilities, permanent parking for facility inspections, operations, and maintenance would be entirely within the substation site or on the access road at the entrance to the substation site.

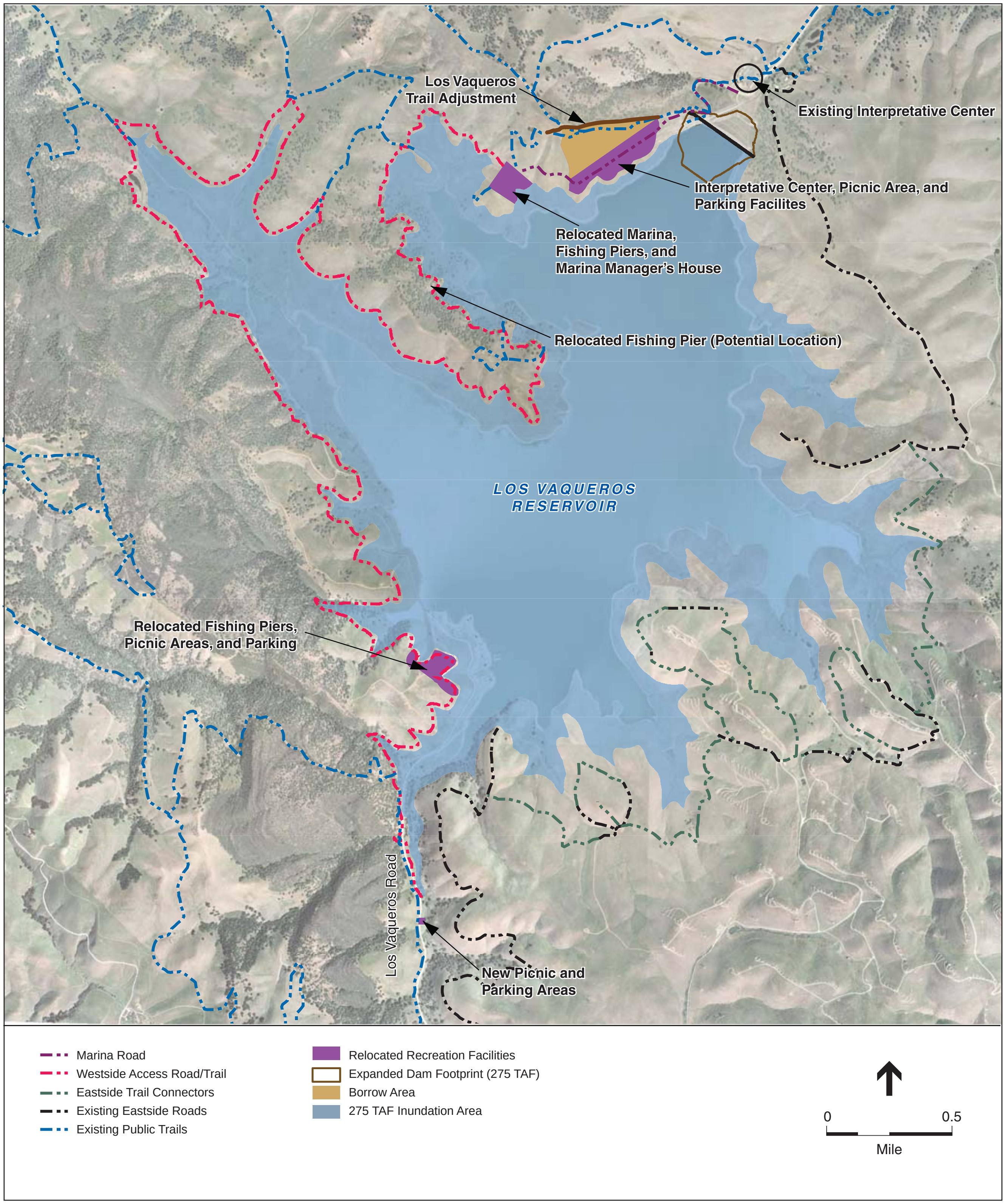
3.5.5 Recreational Facilities

Recreational facilities are included in each of the project alternatives to replace the recreational facilities that would be displaced by reservoir expansion and, in some cases, to enhance recreational opportunities. **Table 3-5** indicates the recreational facilities that would be affected within the proposed 275-TAF and 160-TAF reservoir inundation areas. **Figure 3-28** shows the existing recreational facilities affected by expanding the Los Vaqueros Reservoir to 275 TAF and also shows the proposed relocation areas for these facilities, which include: shoreline hiking trails, Marina facility, fishing piers, and parking and picnic areas. Proposed recreational enhancements for Alternatives 1, 2, and 3 include additional fishing access areas, trails, and an expanded Marina complex to include an additional interpretive center and more berths for rental boats.

TABLE 3-5
RECREATIONAL FACILITIES AFFECTED BY INUNDATION FROM RESERVOIR EXPANSION TO 275 TAF OR 160 TAF

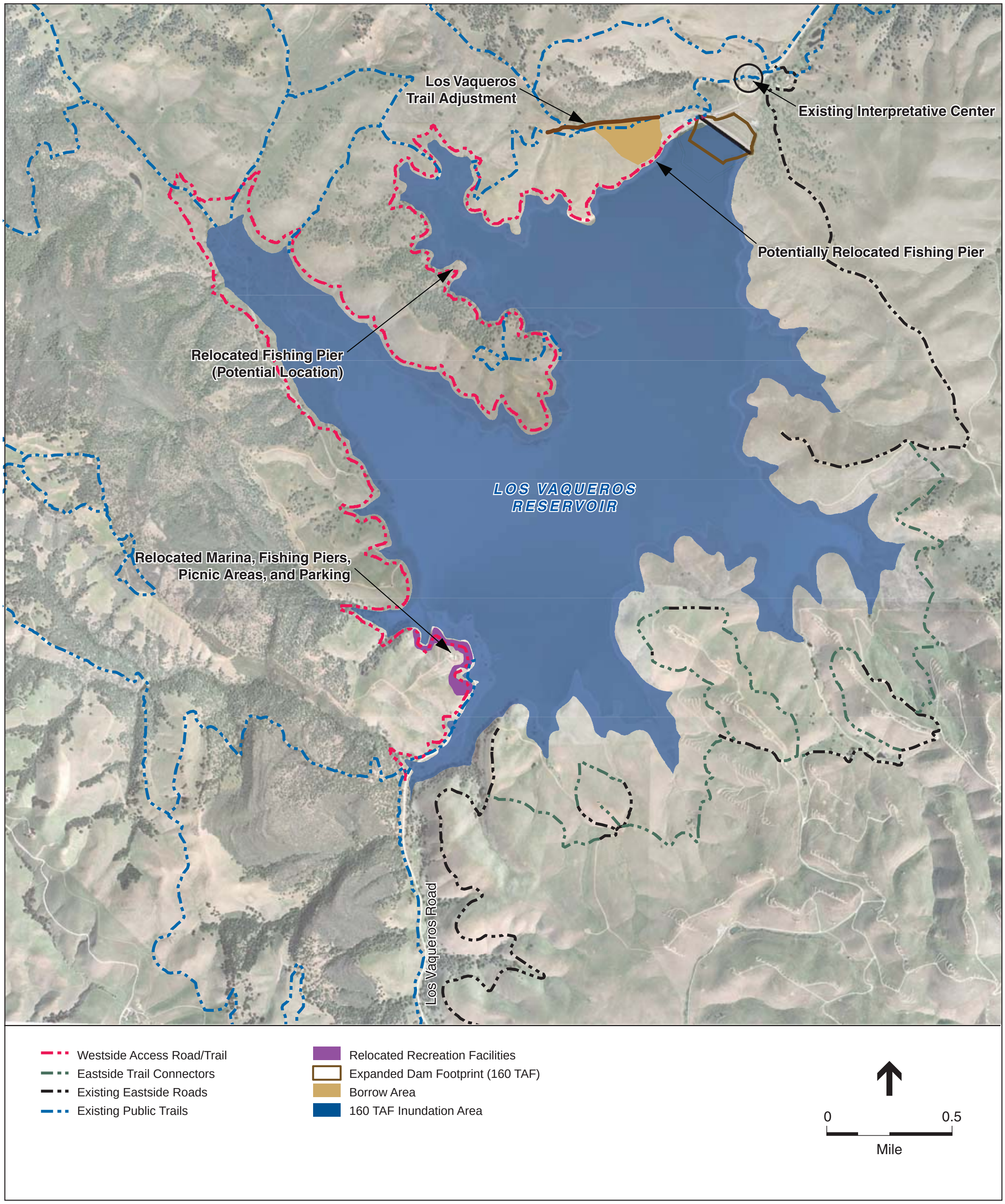
	Parking Spaces	Toilets	Display Panel / Water Station	Picnic Tables	BBQ Units	Fishing Piers	Miscellaneous Facilities
Dam Area	–	1	–	–	–	1	Fishing pier (southwest of dam)
Los Vaqueros Staging Area	61	2	1	–	–	1	Ramp to fishing pier that complies with the Americans with Disabilities Act
Oak Point Picnic Area	–	–	–	7	3	1	Fishing pier
Marina	59	6	–	6	–	–	Marina building, fish-cleaning station, outdoor amphitheater, pay phone, drinking fountain, Marina Manager's residence
Knoll Picnic Area	21	1	–	18	9	–	
Northwest Cove	–	1	–	–	–	1	Fishing pier
Hiking-Only Trails	–	–	–	–	–	–	275 TAF: 8.1 miles (portions of Peninsula, Adobe, Canada, Oak Savannah and Los Vaqueros trails) 160 TAF: 5.96 miles (portions of Peninsula, Adobe, Oak Savannah and Los Vaqueros trails)
Recreation Access Roads	–	–	–	–	–	–	275 TAF: 2.25 miles of road 160 TAF: 0.93 miles of road
Service Roads	–	–	–	–	–	–	275 TAF: 12.5 miles of road 160 TAF: 5.22 miles of road
Total	141	11	1	31	12	4	
Percent Affected	43%	56%	20%	56%	44%	100%	275 TAF: 15% of trails 160 TAF: 11% of trails

Figure 3-29 illustrates the existing recreational facilities affected by expanding the Los Vaqueros Reservoir to 160 TAF and the proposed site for relocation of the Marina facility, fishing piers, and parking and picnic areas. Proposed recreation enhancements for Alternative 4 include additional trails, picnic areas and potentially an additional fishing pier.



SOURCE: GlobeXplorer, 2007; and ESA, 2008

Figure 3-28
Proposed Recreation Facilities –
275 TAF Reservoir Expansion
Alternatives 1, 2, and 3



SOURCE: GlobeXplorer, 2007; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 3-29
Proposed Recreation Facilities –
160 TAF Reservoir Expansion
Alternative 4

Marina Complex

The existing Marina includes the following facilities that would be affected by expanding the Los Vaqueros Reservoir to 275 TAF under Alternatives 1, 2, and 3.

- A series of docks (30 feet by 16 feet) for 30 aluminum electric-powered boats and two 18-foot pontoon boats
- A small dock with boat service equipment
- Parking for 59 cars
- Flush restrooms
- Picnic tables
- A Marina building with outdoor amphitheater
- Miscellaneous facilities such as a fish-cleaning station, a pay phone, and drinking fountain
- A residence for the Marina Manager
- Boat house for water quality sampling boat

Under Alternatives 1, 2 and 3, the Marina would be relocated from the southern end of the reservoir to the northern end of the reservoir near the dam. The new Marina Complex would replace the existing Marina facilities and would provide additional or expanded facilities as well. The new Marina Complex would be compliant with the Americans with Disabilities Act (ADA). An interpretative center, outdoor amphitheater, picnic tables, parking, and miscellaneous facilities would be built next to the dam. Farther west, the Marina Manager's residence, Marina building, fishing piers, fish cleaning station, and docks with covered berths for three boats for rescue and water quality sampling would be constructed. Berths for 50 electric-powered rental boats and two pontoon boats would also be available. Solar panels would be incorporated into the roofing of the Marina Complex and new interpretive center.

Most of the Marina Complex would be built next to the site of the dam material borrow area. A flat area of about 11 acres (about 280 feet wide by 2,100 feet long) would be created on the borrow area site near the dam. Once borrow materials have been excavated from this site, it would be graded to accommodate a new, second interpretive center, amphitheater, parking, staging, and picnic areas.

The new Marina Complex would be accessed from a new road about 1 mile long, constructed over the top of the raised dam, and extended westward to the facilities.

An additional 5-acre flat area would be graded due west to accommodate the Marina Manager's residence, Marina building, docks, fishing piers, picnic area, and parking. Excess material would be disposed of within the reservoir prior to filling. Movable floating docks would be constructed to allow boat access for a range of reservoir surface elevations.

Under Alternative 4, with a 160-TAF reservoir, the Marina would remain at the southern end of the reservoir, but it would be relocated upslope to accommodate the higher water level.

Interpretive Center

Under all alternatives, construction activities in the vicinity of the existing interpretive center would require that the facility be closed during the construction period. During construction, the interpretive center parking could be used for worker parking, minor staging, and/or materials and equipment storage. Upon completion of construction, the existing interpretive center would be reopened to the public. As indicated above, a new, second interpretive center would be constructed west of the dam in the Marina Complex for Alternatives 1, 2, and 3.

Fishing Piers

Expanding the Los Vaqueros Reservoir to 275 TAF under Alternatives 1, 2, and 3 would require the relocation of four fishing piers. The piers include the ADA-compliant fishing pier at the Los Vaqueros staging area that provides access to the Marina and boating facilities, as well as the pier near the dam, the pier in Peninsula Cove, and the piers at the Oak Point Picnic Area (see the next subsection). Some of these piers are associated with staging and picnic areas and share parking with these facilities. The four piers would generally be relocated upslope of their current location around the perimeter of the expanded reservoir. ADA-compliant access would be maintained at the new Marina Complex. The addition of a new, fifth fishing pier is also proposed under Alternatives 1, 2, and 3 (see Figure 3-28). This pier is proposed on the peninsula south of the relocated Marina. To facilitate fishing at the southern end of the reservoir, a fish cleaning station and bait shop are proposed.

The same four fishing piers would need to be relocated under Alternative 4. Proposed locations for replacement piers would generally be upslope of the existing fishing piers. An additional fishing pier could potentially be installed under Alternative 4 (see Figure 3-29) as well.

Day-Use Facilities

Expanding the Los Vaqueros Reservoir under all alternatives would inundate the day-use facilities at the Los Vaqueros staging area (61 parking places, 2 toilets), the Oak Point Picnic Area (7 picnic tables), and the Knoll Picnic Area (21 parking places, 1 toilet and 18 picnic tables). For Alternatives 1, 2, and 3 (with an expansion to 275 TAF), one replacement picnic area would be placed at the new Marina Complex and a second would be placed at the fishing pier on the peninsula south of the new Marina facility. A third picnic area would be established at the new parking area, and hiking trail access would be provided at the southern end of the reservoir, as shown in Figure 3-28.

The picnic areas at the Marina Complex and the south-end access area would be ADA-compliant. These picnic areas would provide similar or improved picnicking opportunities as the three displaced by inundation.

For Alternative 4 with an expansion to 160 TAF, replacement facilities would be generally upslope of the existing facilities.

User Parking

Under Alternatives 1, 2, and 3, parking would be provided at the Marina Complex, the westside trail access point, and the southern end of the reservoir. Overall, a similar number of parking spaces would be provided as at the existing reservoir recreation areas. Under Alternative 4, parking would be provided generally upslope of the existing parking areas.

Access Roads

Under Alternatives 1, 2, and 3, about 2.25 miles of paved access road to the existing Marina would be inundated. No other recreational access roadways would be affected.

A total of 12.5 miles of an unpaved, non-public, all-weather service road along the western shoreline would also be inundated and require relocation to provide access to the western area of the watershed for fire prevention and suppression activities, public safety, and environmental compliance. This westside access road would remain closed to the public.

Under Alternative 4, just less than 1 mile of paved access road to the existing Marina would be inundated along with just over 5 miles of the unpaved westside access road. These roadway segments would be relocated along the perimeter of the expanded reservoir.

Hiking Trails

Under Alternatives 1, 2, and 3, about 8.1 miles of the existing Los Vaqueros, Peninsula, Canada, Adobe, and Oak Savannah Trails (hiking only) would be inundated in the northwestern portion of the reservoir. Due to steep topography and hot, windy climate, the hiking trails are lightly used. About 15.5 miles of replacement hiking trails would be installed to provide expanded access to the same areas and recreational experiences as were available before the reservoir expansion. Comparable reservoir and landscape views would be preserved. Trail connectivity with regional trails in the East Bay Regional Park District's Morgan Territory and Round Valley Regional Preserves would be maintained. **Table 3-6** shows the length of trails that would be inundated by either a 275-TAF reservoir or a 160-TAF reservoir and the proposed replacement trails.

Southern access to the westside trail would be available from Los Vaqueros Road (off Vasco Road). An optional eastside trail could be constructed along the southeastern portion of the reservoir, connecting existing access roads (used to access wind power facilities) in the southern and eastern portions of the watershed. A new park bench would be installed along the eastside trail at a lookout point. A parking lot would be built near the upper inundation limit and would provide direct access to the trailhead. The site would have picnic tables, toilets, and a water station.

Under Alternative 4, about 6 miles of the existing Los Vaqueros, Peninsula, Adobe, and Oak Savannah Trails (hiking only) would be inundated in the northwestern portion of the reservoir and would be replaced. The Canada Trail would not be affected under this alternative. An optional eastside trail could be constructed as part of Alternative 4 as well.

Recreational Fisheries Management

When the expanded reservoir resumes operation, CCWD will restock the reservoir with fish. An enlarged reservoir would be capable of maintaining colder temperatures than the current reservoir, and habitat for coldwater fish species would increase substantially. Habitat for warm-water fish would also increase, as the greater reservoir shoreline would provide additional shallow spawning areas. The restocked fish populations would not immediately provide anglers with the same fishing experience because it could take up to three years for fish populations to increase to current levels.

TABLE 3-6
POTENTIAL REPLACEMENT TRAILS AND RECREATION/SERVICE ACCESS IN THE LOS VAQUEROS WATERSHED – 275-TAF/160-TAF RESERVOIR

	Average Width (Feet)	Existing Length (Miles)	Length Inundated by Reservoir (Miles)	Length Replaced (Miles)	New Disturbance (Acres)	Net Change (Miles)	New Total Length (Miles)
Trails							
Hiking-Only Trail	8	39.2	8.1/6.0	15.5/15.5	15.0/15.0	7.4/9.5	46.6/48.7
Multiuse Trail[a]	12	15.8	0.0/0.0	0.0/0.0	0.0/0.0	0.0/0.0	15.8/15.8
Trails Subtotal	**–**	**55.0**	**8.1/6.0**	**15.5/15.5**	**15.0/15.0**	**7.4/9.5**	**62.4/64.5**
Existing Roads							
Dirt Road	20	68.8	9.4/9.4	0.0/0.0	0.0/0.0	(9.4)/(9.4)	59.4/59.4
Gravel Road	25	27.7	3.3/3.3	0.0/0.0	0.0/0.0	(3.3)/(3.3)	24.4/24.4
Paved Road	32	13.4	2.3/2.3	0.8/0.8	2.9/2.9	(1.5)/(1.5)	11.9/11.9
Road Subtotal	**–**	**109.9**	**15.0/15.0**	**0.8/0.8**	**2.9/2.9**	**(14.2)/(14.2)**	**95.7/95.7**
Access							
North Marina Access Road	32	0.33	0/0	0.9/0.9	3.5/3.5	0.9/0.9	1.2/1.2
South Marina Access Road	32	4.1	2.3/2.3	1.8/1.8	7.9/7.9	(1.9)/(1.9)	3.6/3.6
Westside Service Access Road[b]	12	4.6	4.6/4.6	11.1/10.0	16.1/14.5	6.5/5.4	11.1/10
Eastside Service Access Road[c]	12	8.5	0/0	6.0/6.0	8.7/8.7	6.0/6.0	14.5/14.5
Access Subtotal	**–**	**17.5**	**6.9/6.9**	**19.7/18.7**	**35.0/33.7**	**11.5/10.4**	**30.4/29.3**

TAF = thousand acre-feet

[a] Trail for hiking, biking, and equestrian use.
[b] The westside service access road would not be replaced; rather, it would be combined with the replacement shoreline trail and would be designed to allow single-track, 4-wheel-drive access for watershed staff. It would also provide for hiking only.
[c] Through construction of connection trails, the eastside service access roads could be combined to provide an optional eastside trail for hiking only.

SOURCE: ESA

3.6 Overall Construction Program

3.6.1 Construction Duration

Under all alternatives, implementing the project would require the coordination of multiple activities, construction personnel, and other logistical considerations. Construction is expected to take about three years to complete for Alternatives 1, 2, and 3, and about two years for Alternative 4. This estimate is based on experience with similar projects, including the original Los Vaqueros Reservoir project. The following factors would affect the actual duration of the project: the start of construction (i.e., issuance of the Notice to Proceed), weather impacts, reservoir stage when the Notice to Proceed is issued, disposal options for the dead pool water (water at the bottom of the reservoir that is below the lowest portal of the outlet structure), and the ability to double shift excavation and earthmoving activities. The three-year estimate is based on the following assumptions:

- The Notice to Proceed is issued by early January of Year 1 so the contractors are ready to start at the beginning of the first construction season.
- The reservoir has been emptied to dead pool level by March of Year 1 (275-TAF reservoir only).
- Double shift and Saturday work are implemented.

3.6.2 Work Force and Equipment

The construction labor force would consist of as many as six crews of about 50 to 70 workers each, plus construction management personnel for a total of up to 400 workers at all work sites at one time.

Table 3-7 provides a list of the typical construction equipment expected to be present on site during construction. Equipment operations would occur over two 8-hour shifts typically extending from 6 a.m. to 10 p.m. Equipment might be removed from the site when no longer needed for construction activities.

TABLE 3-7
CONSTRUCTION EQUIPMENT

Clearing, Excavation, Foundation	Building Construction	Interior, Mechanical, Electrical	Road Work, Utilities	Landscaping
• Haul truck • Scraper • Excavator • Loader • Dozer • Sheeps-foot roller • Water truck • Mechanic's Service truck • Dump truck • Light-Duty truck • Backhoe • Conveyer belt • Pile drivers • Drill rig	• Boom truck • Concrete pump truck • Concrete mix truck • Bobcat • Front-end loader • Light-duty truck • Fuel truck • Water truck • Backhoe • Pile Driver • Large crane • Forklift	• Bobcat • Boom truck • Concrete pump truck • Concrete mix truck • Backhoe • Fuel truck • Water truck • Light-duty truck • Large crane	• Motor grader • Excavator • Heavy-duty truck • Sheeps-foot roller and smooth roller • Paving machine • Asphalt delivery Truck • Water truck	• Backhoe • Light-duty truck • Bobcat

The equipment specified for clearing/excavation/foundation, building construction, and interior mechanical/electrical activities would operate for about 8 to 16 hours a day (up to two shifts per day) over 24 months. During road work, utility, and landscaping activities, equipment would also be used 8 to 10 hours a day, but the duration would decrease to about one year. Some equipment such as backhoes and light-duty trucks would be used during multiple stages of project construction, and overlap of equipment types and duration is therefore expected.

3.6.3 Truck Trips and Haul Routes

Roadways that would be directly affected by project construction traffic include local streets providing access to Los Vaqueros Reservoir and several regional connectors and highways that provide access to this portion of eastern Contra Costa County.

Traffic-generating construction activities would include trucks hauling equipment and materials to and from the work sites and the daily arrival and departure of the construction workers. Construction trucks on local roadways would include dump trucks, concrete trucks, and other delivery trucks. Dump trucks would be used for earth-moving and clearing, removal of excavated material, and import of other structural and paving materials. Other trucks would deliver heavy construction equipment, job trailer items, concrete forming materials, piping materials, piles, new facility equipment, and other miscellaneous deliveries.

Based on the locations of the work sites, it is assumed that construction workers would use roads proximate to each day's work site on their daily commute. However, many of the commute trips could use the same major roads (e.g., Vasco Road, Byron Highway, State Route 4, State Route 4 Bypass) to reach the localized roads (e.g., Walnut Boulevard, Camino Diablo, Armstrong Road, Byron Hot Springs Road).

3.7 Permits and Approvals Needed for Alternatives

Construction and operation of an expanded Los Vaqueros Reservoir would require permits and/or approvals from numerous federal, state, and local agencies with regulatory authority over portions of the project. The extent of each agency's authority varies according to jurisdictional mandate, geographic responsibility, and area of expertise.

Section 3.7.1 describes the decisions that participating parties overseeing project implementation would be responsible for making and Section 3.7.2 identifies the regulatory permits and approvals that may need to be issued prior to or as a part of project implementation.

3.7.1 Decisions by Participating Parties

A series of decisions need to be made to enable implementation of any of the alternatives. These decisions include policy direction and financial commitments on the part of the project participants.

Federal Decision Processes

Federal decision making will be based on the information contained in the Federal Feasibility Report, in compliance with the *Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (federal P&Gs)*, and information analyzed in compliance with NEPA (U.S. Water Resources Council, 1983). These documents will present the results of the federal feasibility study authorized by Public Law 108-7 and reaffirmed by Public Law 108-361.

Integral to the federal decision process are other legally required processes and information, such as biological opinions from the Endangered Species Act consultation process and permits required by federal, state and local laws. The federal decision process also includes consideration of input from other federal, state, and local agencies, concerned stakeholders, tribes, and the general public.

The final federal decision is documented in a Record of Decision (ROD). The ROD will address the decision and the alternatives considered; the alternative(s) considered to be environmentally preferable; the factors that were considered; whether or not all practicable means to avoid or minimize environmental harm for the alternative selected have been adopted, and if not, why; any monitoring and enforcement program established to ensure identified mitigation measures are accomplished; and any significant comments received on the Final EIS/EIR.

Reclamation. Reclamation is the federal lead agency, as delegated by the Secretary of the Interior, and therefore is responsible for the preparation and processing of the Federal Feasibility Report and EIS. For efficiency, the EIS has been combined with an EIR, prepared by CCWD for compliance with CEQA.

While the NEPA compliance process is a subset of the federal feasibility study process, there are important distinctions to make. The purpose of the NEPA process is to analyze and disclose the impacts of a range of alternatives, and to provide an opportunity for public review and comment prior to the final federal decision. The purpose of a Federal Feasibility Report is to address engineering, economic, environmental and financial aspects of alternatives, determine the potential benefits and costs, and determine if there is a federal interest in the implementation of a project.

Upon completion of the Final Federal Feasibility Report and the Final EIS/EIR, Reclamation’s Mid-Pacific Regional Director will make a recommendation that will be submitted to the Commissioner of Reclamation for consideration. Then, the Commissioner will concur or modify the recommendation and forward the Final Federal Feasibility Report, Final EIS/EIR, and Draft ROD to the Secretary of the Interior.

Secretary of the Interior. The Secretary will review the Final Federal Feasibility Report and sign the ROD if he or she concurs with the recommendation and then send the Final Federal Feasibility Report, Final EIS/EIR, and signed ROD to the Office of Management and Budget (OMB) for review.

OMB. In accordance with Executive Order 12322, OMB will review the Final Federal Feasibility Report for consistency with the policy and programs of the President, the federal P&Gs, and other applicable laws, regulations and requirements relevant to the federal planning process.

Congress. Congress will review the information provided by the Secretary and OMB, and then decide whether to authorize the recommended project. Congress is responsible for authorizing projects for construction and providing appropriations to construct projects.

Western. As a Cooperating Agency under NEPA, Western is responsible for coordinating with Reclamation in completing the EIS/EIR to comply with the Department of Energy's NEPA implementing regulations. Western would rely on the EIS/EIR when taking action to provide power and associated facilities. Consistent with those implementing regulations, a Purpose and Need statement specific to Western's limited role as a cooperating agency is provided.

- *Purpose*. Once Reclamation and CCWD make a determination as to which alternative and Power Option they have selected, if any, Reclamation and CCWD will then submit an application to Western. Western's purpose, then, will be to evaluate the application and make a decision on that application. Western's objective related to power supply for the Los Vaqueros Reservoir Expansion Project is to develop electrical delivery and transmission infrastructure and supply power as needed to support the Proposed Action. The purpose of new Western facilities and provision of additional supply is to provide additional power capacity to meet peak power as needed under Alternatives 1, 2, or 3.

- *Need*. The need for Western to evaluate the proposal to provide additional infrastructure and power supply for the Los Vaqueros Reservoir Expansion project is driven by lack of sufficient capacity in existing power facilities owned by Western and PG&E to meet peak power needs at expanded or new Los Vaqueros Reservoir system facilities, the potential to reduce impacts by fully utilizing existing power facilities and infrastructure instead of developing all new power facilities, and the limitations on the Los Vaqueros Reservoir Expansion Project benefits if power needs cannot be met.

State and Local Decision Processes

CCWD. As the lead CEQA agency, CCWD is responsible for certifying the Final EIS/EIR is in compliance with CEQA requirements. Upon certification of the Final EIS/EIR, approval of the project and adoption of findings, CCWD would begin implementation of the project by completing design, awarding construction contracts and entering into agreements with participating beneficiaries.

DWR. As a responsible agency under CEQA, DWR would rely on the Final EIS/EIR in making a decision to participate in the Los Vaqueros Reservoir Expansion Project. DWR's decision on whether to participate and at what level will depend in part on the results of a State Feasibility Report being prepared in parallel with this EIS/EIR.

South Bay water agencies. The South Bay water agencies would each make an independent decision on whether to participate in the Los Vaqueros Reservoir Expansion Project based on their individual agency needs and interests. If these agencies decided to participate, they would rely on the Final EIS/EIR for CEQA compliance.

3.7.2 Regulatory Permits and Approvals

Table 3-8 lists the federal, state, and local permits and regulatory approvals that are expected to be necessary for project implementation. The agencies responsible for issuing these approvals would consider the information presented in this document during their deliberations.

TABLE 3-8
PERMITS AND APPROVALS POTENTIALLY NEEDED FOR IMPLEMENTATION OF LOS VAQUEROS RESERVOIR EXPANSION ALTERNATIVES

Permit	Permitting Authority	Affected Project Elements
Federal Permits/Approvals		
Clean Water Act Section 404/ Rivers and Harbor Act Section 10 Dredge and Fill Permit	U.S. Army Corps of Engineers	Expanded Old River Intake and Pump Station and/or new Delta Intake and Pump Station Portions of reservoir and pipelines in wetlands and waters of the U.S.
Federal Endangered Species Act compliance	U.S. Fish and Wildlife Service	All facilities affecting designated special-status species
Federal Endangered Species Act compliance	National Marine Fisheries Service	All facilities affecting designated special-status anadromous fish species and critical habitat
Magnuson Stevens Fisheries Conservation and Management Act	National Marine Fisheries Service	All facilities affecting Essential Fish Habitat
Private Aids to Navigation Permit	U.S. Coast Guard	Expanded Old River Intake and Pump Station and/or new Delta Intake and Pump Station
Transmission Service Request Permit and Open Access Transmission Service Tariff Process	Western Area Power Administration	Power Option 1 and Power Option 2
State Permits/Approvals		
Water Right Permit amendments	State Water Resources Control Board	Project operations
Clean Water Act Section 401 Water Quality Certification	Central Valley Regional Water Quality Control Board	Project components needing Section 404 permit
Clean Water Act Section 401 Waste Discharge Requirements	Central Valley Regional Water Quality Control Board	Portions of reservoir and pipelines in wetlands and waters of the State
California Endangered Species Act compliance	California Department of Fish and Game	All facilities affecting designated special-status species
Section 1601 et seq. Streambed Alteration Agreement	California Department of Fish and Game	Expanded Old River Intake and Pump Station and/or new Delta Intake and Pump Station and any other facility that could potentially impact the bed or banks of a stream channel.
Encroachment Permit	Department of Water Resources, Division of Land and Right of Way	Transfer-Bethany Pipeline, connection to Bethany Reservoir and potential crossing of the California Aqueduct
Dam Design Approval	Division of Safety of Dams	160- or 275-TAF Reservoir Dam Raise

TABLE 3-8 (Continued)
PERMITS AND APPROVALS POTENTIALLY NEEDED FOR IMPLEMENTATION OF LOS VAQUEROS RESERVOIR EXPANSION ALTERNATIVES

Permit	Permitting Authority	Affected Project Elements
State Permits/Approvals (cont.)		
Encroachment Permit	State of California Reclamation Board	Facilities within designated floodway or floodplain Facilities affecting levees under state authority
Encroachment Permit	California Department of Transportation	Portions of project within rights-of-way or easements managed by Caltrans
NPDES Construction Stormwater Permit	Central Valley Regional Water Quality Control Board	Portions of project that may result in discharges to waters of the U.S.
General Order for Dewatering and Other Low Threat Discharge to Surface Waters	Central Valley Regional Water Quality Control Board	Portions of project that could require local groundwater dewatering, resulting in discharges to surface waters
General Permit	State Lands Commission	Portions of new Delta intake and other navigational aides on tidal lands subject to state ownership
National Historic Preservation Act Section 106 Compliance	State Historic Preservation Office	Portions of project that could affect cultural and historic resources considered eligible for inclusion in the National Register of Historic Places
Local Permit/Approvals		
Encroachment Permit	Contra Costa and/or Alameda County(s), and cities	For activities in portions of project area on or affecting rights-of-way or easements managed by Contra Costa or Alameda County or cities or other local jurisdictions
Levee Construction/Maintenance agreement	Reclamation District 800	New Delta Intake and Pump Station

CHAPTER 4

Affected Environment, Environmental Consequences, and Mitigation

4.1 Introduction: Approach to the Environmental Analysis

Organized by environmental resource category, this chapter provides an integrated discussion of the affected environment (including regulatory and environmental settings) and environmental consequences (including direct, indirect, and cumulative impacts and mitigation measures) associated with implementation of the Proposed Action and alternatives.

4.1.1 CEQA and NEPA Requirements

The California Environmental Quality Act (CEQA) Guidelines explain that the environmental analysis for an Environmental Impact Report (EIR) must evaluate impacts associated with the project and identify mitigation for any potentially significant impacts. All phases of a proposed project, including construction and operation, are evaluated in the analysis. Section 15126.2 of the State CEQA Guidelines states:

> An EIR shall identify and focus on the significant environmental effects of the proposed project. In assessing the impact of a proposed project on the environment, the lead agency should normally limit its examination to changes in the existing physical conditions in the affected area as they exist at the time the notice of preparation is published, or where no notice of preparation is published, at the time environmental analysis is commenced. Direct and indirect significant effects of the project on the environment shall be clearly identified and described, giving due consideration to both the short-term and long-term effects.
>
> The discussion should include relevant specifics of the area, the resources involved, physical changes, alterations to ecological systems, and changes induced in population distribution, population concentration, and human use of the land (including commercial and residential development), health and safety problems caused by the physical changes, and other aspects of the resource base such as water, historical resources, scenic quality, and public services. The EIR shall also analyze any significant environmental effects the project might cause by bringing development and people into the area affected.
>
> An EIR must also discuss inconsistencies between the proposed project and applicable general plans and regional plans (State CEQA Guidelines Section 15125[d]).

> An EIR must describe any feasible measures that could minimize significant adverse impacts, and the measures are to be fully enforceable through permit conditions, agreements, or other legally binding instruments (State CEQA Guidelines Section 15126.4[a]). Mitigation measures are not required for effects that are found to be less than significant.

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) specify that a federal agency preparing an Environmental Impact Statement (EIS) must consider the effects of the proposed action and alternatives on the environment; these include effects on ecological, aesthetic, historical, and cultural resources and economic, social, and health effects. Environmental effects are categorized as direct, indirect, and cumulative (defined below in Sections 4.1.2 and 4.1.3). An EIS must also discuss possible conflicts with the objectives of federal, state, regional, and local land use plans, policies, or controls for the area concerned; energy requirements and conservation potential; urban quality; the relationship between short-term uses of the environment and long-term productivity; and irreversible or irretrievable commitments of resources. An EIS must identify relevant, reasonable mitigation measures not already included in the proposed action or alternatives that could avoid, minimize, rectify, reduce, eliminate or compensate for the project's adverse environmental effects (40 Code of Federal Regulations [CFR] 1502.14, 1502.16, 1508.8).

4.1.2 Section Contents and Definition of Terms

Chapter Organization

The environmental setting, impacts, and mitigation measures have been prepared using NEPA terminology (affected environment, environmental consequences, and mitigation measures). Chapter 4 is organized into the following environmental resource or issue areas:

- Section 4.2, Delta Hydrology and Water Quality
- Section 4.3, Delta Fisheries and Aquatic Resources
- Section 4.4, Geology, Soils, and Seismicity
- Section 4.5, Local Hydrology, Drainage, and Groundwater
- Section 4.6, Biological Resources
- Section 4.7, Land Use
- Section 4.8, Agriculture
- Section 4.9, Transportation and Circulation
- Section 4.10, Air Quality
- Section 4.11, Noise
- Section 4.12, Utilities and Public Service Systems
- Section 4.13, Hazardous Materials / Public Health
- Section 4.14, Visual/Aesthetic Resources
- Section 4.15, Recreation
- Section 4.16, Cultural and Paleontological Resources
- Section 4.17, Socioeconomic Effects
- Section 4.18, Environmental Justice
- Section 4.19, Indian Trust Assets
- Section 4.20, Growth-Inducing Effects

Section Contents

Sections 4.2 through 4.19 follow the same general format:

"**Affected Environment**" consists of two subsections: Regulatory Setting and Environmental Setting, which include the following information:

- **Regulatory Setting** identifies the plans, policies, laws, and regulations that are relevant to each topical section and describes permits and other approvals necessary to implement the project. Most of the proposed facilities are located in Contra Costa County; however Alternatives 1 and 2 involve a South Bay Connection to the South Bay Aqueduct pumping plant at Bethany Reservoir located in Alameda County. Therefore, this subsection summarizes or lists the potentially relevant policies and objectives of both the Contra Costa County General Plan and the Alameda County General Plan.

- **Environmental Setting** provides an overview of the physical environmental conditions in the area at the time or prior to the publication of the Notice of Preparation that could be affected by implementation of the Proposed Action or alternatives (i.e., the "affected environment") in accordance with State CEQA Guidelines Section 15125 and NEPA regulations (40 CFR 1502.15).

"**Environmental Consequences and Mitigation Measures**" identifies the impacts of the project on the environment in accordance with State CEQA Guidelines Sections 15126, 15126.2, and 15143 and NEPA regulations (40 CFR 1502.16). The following discussions are included in this subsection:

- **Methods and Assumptions** describes the methods, process, procedures, and/or assumptions used to formulate and conduct the impact analysis.

- **Significance Criteria** provides the criteria used in this document to define the level at which an impact would be considered significant in accordance with CEQA. Significance criteria (sometimes called "thresholds of significance") used in this EIS/EIR are based on the checklist presented in Appendix G of the State CEQA Guidelines; factual or scientific information and data; and regulatory standards of federal, state, and local agencies.

  While CEQA requires a determination of impact significance for each impact discussed in an EIR based on the significance criteria, NEPA does not require this for an EIS. Under NEPA preparation of an EIS is triggered if a federal action has the potential to "significantly affect the quality of the human environment," which is based on the context and intensity for each potential impact. The significance thresholds used in this EIS/EIR also encompass the factors taken into account under NEPA to evaluate the context and the intensity of the effects of an action.

- **Impact Identification.** Project impacts are organized into two categories: **Direct and Indirect Impacts** and **Cumulative Impacts**. Direct impacts are those that are caused by the action and occur at the same time and place. Indirect effects are reasonably foreseeable consequences to the physical environment that may occur at a later time or at a distance from the project area, such as growth-inducing and other effects related to changes in land use patterns, population density, or growth rate. A cumulative impact is an impact that would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

The impacts are listed numerically and sequentially throughout each section. An impact statement precedes the discussion of each impact and provides a summary of the impact topic. The discussion that follows the impact statement includes an analysis that describes the nature, context, and intensity of the impact and is the basis for determining the level of impact. As noted above, impact conclusions are made using impact significance criteria and include consideration of the "context" of the action and the "intensity" (severity) of its effects in accordance with NEPA guidance (40 CFR 1508.27). Each impact is categorized as one of the following:

- **Beneficial Impact:** A beneficial impact would improve the existing conditions. These impacts are coded as B in impact summary tables located throughout this document.

- **Less-than-Significant Impact:** A less-than-significant impact would cause no substantial adverse change in the environment as measured by the applicable significance criterion; therefore, no mitigation would be required. These impacts are coded as LS in impact summary tables located throughout this document.

- **Significant Impact:** A significant impact would cause a substantial adverse change in the physical conditions of the environment. Impacts determined to be significant adverse effects based on the significance criteria fall into two categories: those for which there is feasible mitigation available that would reduce the environmental effects to less than significant levels and those for which there is either no feasible mitigation available or for which, even with implementation of feasible mitigation measures, there would remain a significant adverse effect on the environment.

  <u>Less Than Significant Impact with Mitigation</u>. Significant impacts for which there is feasible mitigation to reduce effects to a less than significant level are coded as LSM to denote that they are less-than-significant with mitigation in impact summary tables located throughout this document.

  <u>Significant, Unavoidable Impact</u>. A significant, unavoidable impact is a substantial adverse change in the environment that cannot be avoided or mitigated to a less-than-significant level if the project is implemented. These impacts are coded as SU in impact summary tables located throughout this document.

- **Mitigation Measures** are presented where feasible to avoid, minimize, rectify, reduce, or compensate for significant, adverse impacts of the project in accordance with the State CEQA Guidelines (Section 15126.4) and NEPA regulations (40 CFR 1508.20). Mitigation measures can include the following strategies:

  – **Avoiding** the impact altogether by not taking an action or parts of an action,

  – **Minimizing** impacts by limiting the degree or magnitude of an action,

  – **Rectifying** the impact by repairing, rehabilitating, or restoring the impacted environment,

  – **Reducing** or eliminating the impact over time through preservation and maintenance operations during the life of the action, or

– **Compensating** for the impact by replacing, preserving, or providing substitute resources or environments.

Each mitigation measure is identified numerically to correspond with the number of the impact it addresses. No mitigation measures are proposed when the impact is determined to be "less than significant." Where sufficient feasible mitigation is not available to reduce impacts to a "less-than-significant" level, the impacts are identified as remaining "significant and unavoidable."

Impact Assessment

Impacts are assessed by comparing project effects to existing environmental conditions and future conditions without the project. For landside resource issues associated with construction and operation of the project alternatives, it is assumed that future conditions without the project would be the same as existing conditions. See Chapter 3.0 for further description of the No Project/No Action Alternative. While some small projects and changes in land use in the project area can be anticipated over time, there are no major development or facilities projects proposed in the area of the proposed project facilities that warrant describing a future-without-project scenario that is different from existing conditions relating to landside resources. Thus, for purposes of this impact analysis for landside issues, the future-without-project conditions are the same as existing conditions.

For water-related issues (i.e., Delta water resources, water quality, fisheries and aquatic resources), future-without-project conditions are not expected to be the same as existing conditions. Conditions in 2030 are expected to include increased water demand and select future projects that could affect Delta water supply and/or water quality. In addition, existing and "Future Without Project" conditions could differ in several respects with regard to water export operations.

For purposes of this impact analysis, existing conditions are defined as the 2005 level of demand for water supply from the Delta along with the 2005 Delta water system infrastructure. Future-Without Project conditions are defined as the projected 2030 levels of demand and the projects and actions shown in the following list that represent reasonably foreseeable future actions. The Future Without Project conditions are based primarily on the "common assumptions" developed in a coordinated effort by Reclamation and the California Department of Water Resources (DWR). Assumptions about these future projects and actions have been incorporated into the Common Assumptions Common Model Package, which includes the water resources and water quality modeling tools used in this impact analysis (see Section 4.2, Delta Hydrology and Water Quality and Appendix C for details on model assumptions and analysis).

What follows is a list of reasonably foreseeable future projects and actions affecting Future Without Project conditions:

- 2030 Level of Development – Projection of 2030 demands for Delta water supply and 2030 land use changes

- South Delta Improvement Project, Phase I – Installation of permanent operable barriers in the south Delta (Phase II is not included in this analysis)

- South Bay Aqueduct Enlargement – Enlargement of conveyance capacity for the South Bay Aqueduct from 300 cubic feet per second (cfs) to 430 cfs (now under construction).

- Contra Costa Water District (CCWD) Canal Replacement Project – Replacement of the unlined portion of the Contra Costa Canal with a pipeline

- Delta-Mendota Canal-California Aqueduct Intertie – Increase of Delta water supply conveyance capacity from 4,200 cfs to 4,600 cfs

- Freeport Regional Water Project – Implementation of water supply project by the Freeport Regional Water Authority, comprising East Bay Municipal Utility District (EBMUD) and Sacramento County

- CCWD-EBMUD Intertie – Diversion of up to 3.2 thousand acre-feet (TAF) per year of CCWD/Central Valley Project (CVP) water via the Freeport Regional Water Project with delivery to CCWD via the CCWD-EBMUD Intertie

- Level 2 Federal Refuge Water Supply – Assumption of firm Level 2 refuge water supply needs within the Sacramento and San Joaquin valleys

- Sacramento Area Water Forum American River Water Rights –Assumptions regarding exercise of existing American River water rights as described in the Common Assumptions documentation

- Placer County Water Agency Pump Station Expansion Project – Expansion of Placer County Water Agency's pump station on the American River to divert up to 35 TAF/year of CVP supply

- Phase 8 Settlement Agreement – A Sacramento Valley groundwater substitution program that supplies up to 185 TAF/year to the State Water Project (SWP) and CVP

- Dedicated CVP Conveyance at SWP Banks Pumping Plant –SWP conveyance of 50 TAF/year of Level 2 refuge water for the CVP in July and August of each year

- North-of-Delta Accounting Adjustments – Through adjustments to the 1986 Coordinate Operations Agreement, release by the CVP of up to 37.5 TAF/year from Shasta Reservoir for the SWP to meet in-basin requirements

The Bay Delta Conservation Plan, now in development, is not included as part of Future-Without Project conditions. At present, this planning effort has identified a broad range of potential options to modify water conveyance through and/or around the Delta. Environmental review for the Bay Delta Conservation Plan is just beginning and will be part of the process to identify a preferred plan. Implementation of any of the options under consideration could substantially alter conditions in the Delta. However, there is insufficient information about any of the alternative options to include this conservation plan at this time as part of the No Action/No Project Alternative or the Future Without Project conditions.

4.1.3 Cumulative Impact Analysis

Definition of Cumulative Impacts

Cumulative impacts are defined in the State CEQA Guidelines (Section 15355) as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.” A cumulative impact is “the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor, but collectively significant, projects taking place over a period of time.” In a manner consistent with state CEQA Guidelines Section 15130[a], the discussion of cumulative impacts in this EIS/EIR focuses on potentially significant cumulative impacts.

The NEPA regulations define a cumulative impact as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions over time and differ from indirect impacts (40 CFR 1508.8). They are caused by the incremental increase in total environmental effects, when the evaluated project is added to other past, present, and reasonably foreseeable future actions.

Methodology

The evaluation of potential cumulative effects in this EIS/EIR is subdivided into landside resources and waterside resources in order to address these two generally distinct categories of effects associated with the project alternatives. Siting, construction and operation of each of the new and expanded facilities under the project alternatives would affect land based resources and issue areas including: geology, soils, and seismicity; local hydrology, drainage and groundwater; biological resources; land use; agriculture; transportation and circulation; air quality; noise and vibration; utilities and public services; visual/aesthetic resources; recreation; cultural and paleontological resources; socioeconomic effects; environmental justice; and Indian Trust Assets. Operation of the overall expanded Los Vaqueros Reservoir system to divert water from the Delta for storage and delivery in a manner and on a schedule that achieves the project objectives would affect water-based resources and issue areas (labeled here “waterside”) including: Delta hydrology and water quality, and Delta fisheries and aquatic resources. The projects and plans that might contribute to cumulative effects on landside resources are different from those potentially affecting waterside resources.

To identify activities to be analyzed in the evaluation of cumulative impacts, Section 15130(b) of the state CEQA Guidelines recommends:

- The “list approach,” which entails listing past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency; or

- The "projection approach," which uses a summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document that has been adopted or certified, which described or evaluated regional or area-wide conditions contributing to the cumulative impact.

For most resource areas, both landside and waterside, the list approach is used. For landside resource issues in this case, a list of potentially relevant projects was compiled based on a review of local and regional development, infrastructure, and transportation projects. For the waterside resource issues, the compiled list comprises major regional water resource projects as well as assumptions regarding operation of the state and federal Delta water systems. The lists of relevant projects considered in the cumulative effects analysis for landside and waterside issue areas are provided below. The geographic scope of the cumulative impact evaluation varies depending on the resource area being analyzed. **Table 4.1-1** indicates the general geographic scope considered for each resource area. The "Cumulative Impacts" subsection for each resource topic begins with a summary of the approach and the geographic area relevant to that topic.

Landside Resources

As indicated in Table 4.1-1, the appropriate geographic scope for cumulative effects analysis associated with the landside resource areas ranges from site-specific to regional, encompassing primarily eastern Contra Costa County, but also potentially including eastern Alameda County and western San Joaquin County. In addition, since many of the project effects on landside resources result from construction activities and would be short-term, lasting only until construction is completed (e.g., construction traffic, noise, or site erosion), projects proposed for construction in the same timeframe as the Los Vaqueros Reservoir Expansion Project (approximately 2012 to 2015) are particularly relevant for evaluation of potential cumulative effects.

A list of possible projects for consideration in evaluation of potential cumulative effects on landside resources was compiled based on review of publically available information as well as contacts with local and regional planning, public works departments, and special districts or agencies (e.g., parks) (see **Appendix I**).

The following regional and local plans were also reviewed as part of this process:

- Contra Costa County General Plan
- East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan
- City of Brentwood General Plan
- Alameda County East County Area Plan - A Portion of the Alameda County General Plan
- San Joaquin County General Plan
- Mountain House Master Plan
- San Joaquin Council of Governments 2007 Regional Transportation Plan
- Metropolitan Transportation Commission Transportation 2030 Plan
- Bay Area Air Quality Management District Year 2000 Plan

TABLE 4.1-1
GEOGRAPHIC SCOPE FOR EACH RESOURCE AREA CONSIDERED FOR CUMULATIVE EFFECTS ANALYSIS

Resource Area	Section	Geographic Scope
Waterside		
Delta Hydrology and Water Quality	4.2	Sacramento-San Joaquin Delta system as reflected in the CalSim model. Also local Delta channels at and near the existing CCWD intake facilities including Old River and Victoria Canal, and the proposed new intake facility on Old River.
Delta Fisheries and Aquatic Resources	4.3	Sacramento-San Joaquin Delta system as reflected in the CalSim model. Also local Delta channels at and near the existing CCWD intake facilities including Old River and Victoria Canal, and the proposed new intake facility on Old River.
Landside		
Geology, Soils and Seismicity	4.4	Site-specific. Individual construction sites or other ground disturbance area associated with the project.
Local Hydrology, Drainage and Groundwater	4.5	Local. Local drainage system and individual construction / grading sites. Local groundwater resources at individual construction sites.
Terrestrial Biology	4.6	Regional. Los Vaqueros Watershed, eastern Contra Costa and Alameda counties and western San Joaquin County
Land Use	4.7	Local. Individual facility sites and immediate vicinity.
Agriculture	4.8	Local and Regional. Individual facility sites and immediate vicinity as well as eastern Contra Costa County.
Transportation and Circulation	4.9	Local and Regional. Roadway network within and to eastern Contra Costa County (includes local roadways in eastern Contra Costa County and major freeways / roadways in Contra Costa, Alameda, and San Joaquin counties).
Air Quality	4.10	Regional. Bay Area Air Basin. Global for greenhouse gas emissions.
Noise and Vibration	4.11	Local. Immediate vicinity of individual facility sites (i.e., typically within half a mile or less, depending on the nature of the project noise source).
Utilities and Public Services	4.12	Local. Local utility and public services service areas.
Hazardous Materials / Public Health	4.13	Local. Individual facility sites and immediate vicinity for hazardous materials and EMF.
Visual/Aesthetic Resources	4.14	Local. Individual facility sites and local viewshed.
Recreation	4.15	Local and Regional. Local recreation facilities / areas near facility sites. Regional recreation areas that provide recreational uses similar to the existing Los Vaqueros Reservoir.
Cultural Resources	4.16	Local. Individual construction sites or other ground disturbance areas and immediate vicinity. Potential regional implications, depending on nature of resources affected.
Paleontological Resources	4.16	Site-specific. Individual construction sites or other ground disturbance area associated with the project.
Socioeconomics	4.17	Regional. Contra Costa County.
Environmental Justice	4.18	Local and Regional. Communities near project facilities in eastern Contra Costa County.
Indian Trust Assets	4.19	Local. Sites near proposed project facilities.

The list of planned and possible projects was screened to determine which projects had the potential to contribute to cumulative effects in combination with the Los Vaqueros Reservoir Expansion project. If a future project was not reasonably probable, it was not included in the analysis. Further, a project was eliminated from further consideration of cumulative effects for one or more of the following reasons:

- It would not be constructed in a location where its effects would combine with the effects of the proposed Los Vaqueros Reservoir Expansion project;
- It would not be constructed at the same time as the proposed project;
- It would not generate the same type of impacts as those resulting from the proposed Los Vaqueros Reservoir Expansion
- A project or activity would be too small to make a considerable contribution to cumulative effects in combination with the proposed project.

See Appendix I for a review of the reasons projects were retained or eliminated from further consideration in the cumulative effects analysis.

Table 4.1-2 describes the projects retained for consideration in the assessment of potential cumulative effects on landside resources. It indicates whether the project might contribute to cumulative construction effects; siting or footprint effects, such as habitat or farmland loss; and/or operational effects in combination with one or more of the project alternatives. As appropriate and indicated in each environmental resource section, the projects listed in this table are considered in the analysis of cumulative effects for landside resources.

Waterside Resources

For the water-related issues addressed in Sections 4.2 and 4.3, the analysis of cumulative impacts was based partly on an estimation of anticipated future cumulative conditions established through a system-wide hydrologic and operations modeling process. Projects and conditions or activities considered in the assessment of cumulative effects on the Delta water resources and aquatic and fishery resources are listed above in Section 4.1.2 and further described in Section 4.2, Delta Hydrology and Water Quality. These and other water resource modeling assumptions are described in detail in Appendix C, Delta Water Resources - Modeling Analysis (see Chapter C-2). As described above, these assumptions about future conditions build on the set of “common assumptions” developed by CCWD, Reclamation, and DWR.

In addition to the assumptions about future projects and actions incorporated into the modeling tools, the Stockton Delta Water Supply Project is also discussed in the cumulative effects analysis. This project has not yet been fully permitted and, therefore, was not incorporated into the modeling tool; however, it is evaluated along with the Los Vaqueros Reservoir Expansion Project for potential cumulative effects on Delta water resources. The Bay Delta Conservation Plan, now in development, is not included in the cumulative effects analysis. There is insufficient information about any of the broad range of alternative options at this time to include it in the cumulative effects analysis.

TABLE 4.1-2
PROJECTS CONSIDERED IN THE ANALYSIS OF CUMULATIVE EFFECTS ON LAND-SIDE RESOURCES

Project	Relationship to Proposed Project	Area of Potential Cumulative Effect
City of Brentwood. A total of 4,844 residential units and 1,373,275 square feet of commercial development are currently planned for construction by 2018. Of this total, 484 units are under construction, 3889 units are approved, but no permit has been issued and 471 units are proposed but are not yet approved. Some units are under construction with project approval up until 2018.	4.5 miles north of the Delta-Transfer Pipeline	**Construction:** Possible construction period overlap. Consider for potential cumulative construction effects related to traffic and air quality. **Siting:** Consider potential cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Buried Delta-Transfer Pipeline, the project facility nearest to this development (Alternatives 1, 2, and 3) would not generate operational effects (e.g., noise). This development is too far from proposed Old River Intake and Pump Station Expansion (Alternative 3 only) for cumulative operational noise effects.
Cecchini Ranch, Discovery Bay. A 1,110 acre mixed used development with up to 4,000 residences, new marina, commercial and light industrial uses, new parks, schools, open space and delta interpretive center. Development plan and General Plan Amendment proposal in progress with CEQA process to follow. Possible construction start time frame between 2014 and 2018.	Just north of project area, north of SR 4, Old River Pump Station and Delta-Transfer Pipeline alignment along SR 4.	**Construction:** Possible construction period overlap. Consider for potential cumulative construction effects related to noise, traffic and air quality. **Siting:** Consider potential cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Buried Delta-Transfer Pipeline, the project facility nearest to this development (Alternatives 1, 2, and 3) would not generate operational effects (e.g., noise). This development is too far from proposed Old River Intake and Pump Station Expansion (Alternative 3 only) for cumulative operational noise effects.
Bixler Road Business Park, Discovery Bay. Change in land use designation from Office (OF) to Business Park (BP) to establish a 62,500 sq. ft. business park. Applications submitted 12/11/2006 and are under review. Applicant is trying to address issue with driveway entrance encroaching onto irrigation canal.	0.5 miles north of the Delta-Transfer Pipeline	**Construction:** Possible construction period overlap. Consider for potential cumulative construction effects related to traffic and air quality. **Siting:** Consider potential cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Buried Delta-Transfer Pipeline, the project facility nearest to this development (Alternatives 1, 2, and 3) would not generate operational effects (e.g., noise). This development is too far from proposed Old River Intake and Pump Station Expansion (Alternative 3 only) for cumulative operational noise effects.
Pantages Bay at Discovery Bay. Change in the land use designation from Agricultural Lands (AL) to Single Family Residential-High Density (SH) to allow for an approximately 290 unit water-oriented residential project. Approximately 172 acres in size. EIR to be released soon and ground work is estimated to begin in 2010.	2 miles north of Old River Intake	**Construction:** Possible construction period overlap. Consider for potential cumulative construction effects related to traffic and air quality. **Siting:** Consider potential cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Buried Delta-Transfer Pipeline, the project facility nearest to this development (Alternatives 1, 2, and 3) would not generate operational effects (e.g., noise). This development is too far from proposed Old River Intake and Pump Station Expansion (Alternative 3 only) for cumulative operational noise effects.
Bixler Road Commercial Project, Discovery Bay. GPA study to re-designate 46 acre parcel from Agricultural Lands (AL) to a mix of commercial, office, and light industrial uses. GPA study authorized, but no applications submitted to date.	1 mile north of Delta-Transfer Pipeline	**Construction:** Possible construction period overlap. Consider for potential cumulative construction effects related to traffic and air quality. **Siting:** Consider potential cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Buried Delta-Transfer Pipeline, the project facility nearest to this development (Alternatives 1, 2, and 3) would not generate operational effects (e.g., noise). This development is too far from proposed Old River Intake and Pump Station Expansion (Alternative 3 only) for cumulative operational noise effects.

TABLE 4.1-2 (Continued)
PROJECTS CONSIDERED IN THE ANALYSIS OF CUMULATIVE EFFECTS ON LAND-SIDE RESOURCES

Project	Relationship to Proposed Project	Area of Potential Cumulative Effect
Bixler Road Residential Project, Discovery Bay. GPA study to re-designate Agricultural Lands (AL) to combination of Single Family Residential – High Density (SH), Open Space (OS), and Parks and Recreation (PR) in order to subdivide and develop 20-acre sire into 68 single family lots. GPA authorized, but no applications submitted to date.	1.5 miles north of Delta-Transfer Pipeline	**Construction:** Possible construction period overlap. Consider for potential cumulative construction effects related to noise, traffic and air quality. **Siting:** Consider potential cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Buried Delta-Transfer Pipeline, the project facility nearest to this development (Alternatives 1, 2, and 3) would not generate operational effects (e.g., noise). This development is too far from proposed Old River Intake and Pump Station Expansion (Alternative 3 only) for cumulative operational noise effects.
Discovery Bay / Byron Wastewater Treatment Plant Upgrade	Just north of project area, north of SR 4, Old River Pump Station and north of Delta-Transfer Pipeline alignment along SR 4	**Construction:** No. Improvements to be completed by mid-2009 **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** No
CCWD Alternative Intake Project (AIP). New Delta water intake on Victoria Island. CCWD will use, not to increase total water diversion, but to maximize water quality of the water it diverts from the Delta. Construction in progress; to be completed in 2009.	Victoria Island, across Old River from Old River Pump Station and proposed Delta Intake and Pump Station	**Construction:** No construction period overlap with proposed project; therefore no cumulative construction effects. **Siting:** Consider potential for cumulative effects related to loss of farmland and Delta channel shoreline/riparian habitat. **Operations:** No. Too far from proposed project facilities to result in cumulative noise effects.
Brentwood Solid Waste Transfer Facility Expansion	North of project area and north of Expanded Transfer Facility site	**Construction:** Possible construction period overlap. Consider potential for cumulative construction effects related to noise, traffic and air quality. **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** Consider potential cumulative effects related to increased operational traffic.
Byron Bethany Irrigation District Corporate Offices	Just east of Transfer-Bethany Pipeline alignment	**Construction:** Expected to be completed by 2010. **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. Proposed project would not result in operational impacts, such as noise or increased traffic in the vicinity of the BBID office project.
Green Waste Recycling Facility – Byron	East of Transfer-Bethany Pipeline alignment	**Construction:** No construction period overlap with proposed project; therefore no cumulative construction effects. **Siting:** No. footprint impacts, if any, too minor to make cumulatively considerable contribution to loss of habitat and/or important farmland. **Operations:** Consider potential for cumulative effects related to increased operational traffic.

TABLE 4.1-2 (Continued)
PROJECTS CONSIDERED IN THE ANALYSIS OF CUMULATIVE EFFECTS ON LAND-SIDE RESOURCES

Project	Relationship to Proposed Project	Area of Potential Cumulative Effect
Zone 7 Altamont Water Treatment Plant and Pipeline – northeastern Alameda County (Dyer Road). 42 mgd WTP, raw water conveyance, intake and pump.	West of Bethany Reservoir, the southern terminous of the proposed Transfer-Bethany Pipeline	**Construction:** No construction period overlap with proposed project; therefore no cumulative construction effects. **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** NA
DWR South Bay Aqueduct Enlargement Project – Northeastern Alameda County. Capacity enlargement of SBA canal system that extends from Bethany Reservoir west and south to Bay Area customers. Construction to be completed in 2009	Extends west from Bethany Reservoir, which is the southern terminous of the proposed Transfer-Bethany Pipeline	**Construction:** No construction period overlap with proposed project; therefore no cumulative construction effects. **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** Operation of the expanded capacity is included in the impact modeling for “future without project” conditions.
Mountain House Community – northwestern San Joaquin County. Future phases of multi-year build out of new community on 4,784 acres including 2,500 acres for residential, 700 acres commercial, and 750 acres open space and parks. Total ultimate population projected to be 43,500. First phase – 14 neighborhoods have been completed.	Just east of Bethany Reservoir, the southern terminous of the proposed Transfer-Bethany Pipeline	**Construction:** No. Area access by different regional roads and too far away to generate cumulative construction effects in combination with the project. **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** No.
Road Safety Improvement and Widening Projects: SR 4, Vasco Road, Walnut Boulevard Widening, Byron Highway, – Southeastern Contra Costa and northeastern Alameda Counties. Phased improvements for safety and traffic congestion reduction that include widening, land reconfiguration, restriping, and addition of safety railing / barriers and signage.	Key regional traffic access route to and through project area.	**Construction:** Most improvements scheduled for completion prior to LV project construction but some construction schedule overlap is possible. Consider potential for cumulative traffic, noise, and air quality effects. **Siting:** Consider potential for cumulative effects related to loss of habitat and/or important farmland. **Operations:** No. No relevant operational effects from road improvement projects.

AIP = Alternative Intake Project
BBID = Byron-Bethany Irrigation District
CCWD = Contra Costa Water District
CEQA = California Environmental Quality Act
LV = Los Vaqueros
mgd = million gallons per day
SBA = South Bay Aqueduct
SR = State Route
WTP = water treatment plant

4.1.4 Resources Eliminated from Detailed Analysis

The State CEQA Guidelines provide for identifying and eliminating from detailed study issues that are not significant or that have been covered by prior environmental review (Pub. Res. Code 21002.1). The NEPA regulations provide similar provisions (40 CFR 1501.7 [a][3]). During initial scoping with the public and governmental agencies, and based on information obtained through literature review, agency correspondence, consultations, and field data collection, it was determined that mineral resources would not experience any potential environmental impacts resulting from the proposed project or any of the alternatives. Accordingly, mineral resources are not addressed further in this EIS/EIR but are identified below with a brief discussion of why impacts to each resource are not anticipated.

Mineral Resources

The project alternatives would not affect any known sand, gravel, natural gas, gold, or silver areas or result in the loss of availability of any known mineral resource. Potential project facilities associated with the proposed project or any alternative do not fall within any areas identified by the Contra Costa County General Plan (2005) as mineral resource areas. Siting and construction of project facilities would not cover, conceal, or otherwise make inaccessible such resources.

The project would make use of sand and gravel resources as construction materials. As described in Section 3.5 of the project description, much of the clay and coarser shell materials required for dam construction would be taken from borrow sites within the Los Vaqueros Reservoir, as they were for the original dam. The project would make use of, but would not interfere with, any existing commercial mining activity. No oil and gas operations exist in the study area. Therefore, no impacts to mineral resources would occur, and no further evaluation is included in this EIS/EIR. Geology and soils (including peat), however, are addressed in Section 4.4, Geology, Soils, and Seismicity.

4.2 Delta Hydrology and Water Quality

This section describes the existing surface water hydrology, supply, management, and water quality conditions of the Sacramento–San Joaquin Delta (the Delta), as well as the existing conditions within the Sacramento River downstream of Lake Shasta. The section also discusses the regulatory setting, including water rights and water service contracts, and provides an analysis of potential water supply, water quality, and water level impacts resulting from implementation of the project alternatives.

4.2.1 Affected Environment

Regulatory Setting

Federal

Clean Water Act

The Clean Water Act establishes the basic structure for regulating discharges of pollutants into "waters of the United States." The act specifies a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff.

Section 303(d) requires states, territories, and authorized tribes to develop a list of water-quality limited segments of rivers and other water bodies under their jurisdiction. These waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the list and develop action plans, called Total Maximum Daily Loads (TMDL), to improve water quality.

Delta waterways are included in the Central Valley Regional Water Quality Control Board's (CVRWQCB) list of 303(d) impaired waterways for the following constituents: chlorpyrifos, DDT (dichlorodiphenyltrichloroethane), diazinon, exotic species, group A pesticides, mercury, unknown toxicity, organic enrichment/low dissolved oxygen (Stockton Ship Canal), and electrical conductivity(water export area). Of these constituents, the U.S. Environmental Protection Agency (EPA) has approved TMDLs for the following: organic enrichment/low dissolved oxygen. TMDLs for other constituents remain under planning or development.

Section 401 requires every applicant for a federal permit or license for any activity that may result in a discharge to a water body to obtain a water quality certification that the proposed activity will comply with applicable water quality standards.

Section 402 regulates point- and nonpoint-source discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program. In California, the State Water Resources Control Board (SWRCB) oversees the NPDES program, which is administered by the Regional Water Quality Control Boards (RWQCBs). The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits.

Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including some wetlands. Activities in waters of the U.S. that are regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry. Under Section 404(b)(1) of the Act, the Least Environmentally Damaging Practicable Alternative (LEDPA) must be identified from among those alternatives considered in detail in the EIS/EIR. If a federal agency is a partner in the implementation of a project, then the Proposed Action/Project must be recognized as the LEDPA. A 404(b)(1) evaluation will be included with the Final EIS/EIR pursuant to the Act to provide required information on the potential effects of the proposed action/project regarding water quality and rationale in support of identifying the LEDPA. This Draft EIS/EIR will be reviewed by concerned public and stakeholders with the opportunity to provide comments on the alternatives and documentation before making determinations of the Proposed Action/Project, LEDPA, environmentally preferred alternative, and environmentally superior alternative in the Final EIS/EIR.

Construction of the proposed project, including construction of the proposed intake facilities, pipelines, expanded reservoir, appurtenant facilities, and other associated facilities, would be subject to regulation under Sections 401, 402, and/or 404 of the Clean Water Act.

Rivers and Harbors Act

The U.S. Army Corps of Engineers (USACE) regulates the construction of any structure or work within navigable waters under Sections 9 and 10 of the Rivers and Harbors Act. The USACE regulates the construction of wharves, breakwaters, and jetties; bank protection and stabilization projects; permanent mooring structures, vessels, and marinas; intake and outfall pipes; canals; boat ramps; aids to navigation; and other modifications affecting the course, location, condition, and capacity of navigable waters. The USACE jurisdiction under the Rivers and Harbors Act is limited to “navigable waters,” or waters subject to the ebb and flow of the tide shoreward to the mean high water mark that may be used for interstate or foreign commerce.

The USACE must consider the following criteria when evaluating projects within navigable waters: (1) the public and private need for the project; (2) reasonable alternative locations and methods; and (3) the beneficial and detrimental effects on the public and private uses to which the area is suited. The Rivers and Harbors Act would be applicable to the new Delta Intake and Pump Station.

Central Valley Project Improvement Act

The Central Valley Project Improvement Act (1992) amended the previous authorizations of the Central Valley Project (CVP) to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as a project purpose equal in priority to power generation. It is described in Section 2.3.1.

The CVP Improvement Act is relevant to all aspects of the project alternatives that would result in diversion of CVP water from the Delta, or use of CVP water to enhance fish and wildlife.

Safe Drinking Water Act

The Safe Drinking Water Act was established to protect the quality of waters actually or potentially designated for drinking use, whether from aboveground or underground sources. Contaminants of concern in a domestic water supply are those that either pose a health threat or in some way alter the aesthetic acceptability of the water. Primary and secondary maximum contaminant levels (MCLs) are established for numerous constituents of concern including turbidity, total dissolved solids (TDS), chloride (Cl), fluoride, nitrate, priority pollutant metals and organic compounds, selenium, bromate, trihalomethane and haloacetic acid precursors, radioactive compounds, and gross radioactivity. All domestic water suppliers must follow the requirements established by this Act and its associated amendments.

Surface Water Treatment Rule

The Federal Surface Water Treatment Rule is implemented by the California Surface Water Treatment Rule, which satisfies three specific requirements of the Safe Drinking Water Act by: (1) establishing criteria for determining when filtration is required for surface waters; (2) defining minimum levels of disinfection for surface waters; and (3) addressing *Cryptosporidium spp., Giardia lamblia, Legionella spp., E. Coli,* viruses, turbidity, and heterotrophic plate count by setting a treatment technique. A treatment technique is set in lieu of an MCL for a contaminant when it is not technologically or economically feasible to measure that contaminant. The Surface Water Treatment Rule applies to all drinking water supply activities in California; its implementation is overseen by the California Department of Health Services (DHS).

Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rule and Long-Term 1 and Long-Term 2 Enhanced Surface Water Treatment Rule

The Stage 1 Disinfectants and Disinfection Byproducts Rule established maximum residual disinfectant level goals and maximum residual disinfectant levels for chlorine, chloramines, and chlorine dioxide. It also establishes MCL goals and MCLs for trihalomethanes, five haloacetic acids, chlorite, and bromate. The primary purpose of the Long-Term 1 Enhanced Surface Water Treatment Rule is to improve microbial control, especially for *Cryptosporidium*.

Water systems that use surface water and conventional filtration treatment are required to remove specified percentages of organic materials, measured as total organic carbon (TOC), which may react with disinfectants to form disinfection byproducts (DBPs). Removal is to be achieved through a treatment technique (e.g., enhanced coagulation or enhanced softening), unless the system meets alternative criteria.

The U.S. EPA adopted the Stage 2 Microbial and Disinfection Byproducts Rules in January 2006. The Rules include both the Stage 2 Disinfectants and Disinfection Byproducts Rule and Long-Term 2 Enhanced Surface Water Treatment Rule. These rules include revised and new requirements, such as water systems having to meet DBP MCLs at each monitoring site in the distribution system, rather than averaging multiple sites. The rules also contain a risk-targeting approach to better identify monitoring sites where customers are exposed to high levels of DBPs. The rules include new requirements for treatment efficacy and *Cryptosporidium* inactivation/removal, as well as new standards for DBPs, disinfectants, and potential contaminants.

The overall goal of this group of regulations is to balance the risks from microbial pathogens with those from carcinogenic DBPs. All domestic water suppliers must follow the requirements of these rules, which are overseen by DHS.

Coordinated Operations Agreement

The Coordinated Operations Agreement (COA), signed in 1986, is an agreement between the State of California (represented by the Department of Water Resources [DWR]) and the federal government (represented by the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region [Reclamation]). The purpose of the COA is to coordinate the operations of the CVP and the State Water Project (SWP). The COA defines each project's responsibility to protect other beneficial uses of water, and defines the sharing of excess water between the projects.

The procedure for sharing responsibility for demands and for sharing excesses of water is defined under two conditions: balanced water conditions and excess water conditions. Balanced water conditions occur when upstream releases plus unregulated flows equal the water supply needed to meet in-basin uses plus CVP and SWP Delta diversions, which include withdrawals under CVP and SWP water right permits at the Jones (formerly Tracy) Pumping Plant, the Banks Pumping Plant, the Contra Costa Canal Pumping Plant #1, and the North Bay Aqueduct. Excess water conditions occur when upstream releases plus unregulated flows exceed the water supply needed to meet in-basin uses plus SWP and CVP Delta diversion.

The COA stipulates that the CVP and SWP will coordinate responsibility for meeting Sacramento Valley in-basin use and for sharing any unstored water for export. When stored water is needed for in-basin use then the CVP agrees to provide 75 percent of the water necessary to meet the standard while the SWP provides the remaining 25 percent. If unstored water is available for export, then the CVP is entitled to use 55 percent of the excess available water and the SWP is entitled to the remaining 45 percent. Any water that is not used by one project is available for use by the other project, or it flows out of the Delta as surplus. These rules were established to account for meeting SWRCB Decision 1485. Subsequent changes to the Water Quality Control Plan have resulted in modifications to these rules by mutual agreement between Reclamation and DWR.

State

Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act, water quality objectives are limits or levels of water quality constituents or characteristics established for the purpose of protecting beneficial uses. The Act requires the RWQCBs to establish water quality objectives while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, also constitute water quality standards under the federal Clean Water Act. Therefore, the water quality objectives form the regulatory references for meeting state and federal requirements for water quality control.

A change in water quality is only allowed if the change is consistent with the maximum beneficial use of the waters of the state, would not unreasonably affect the present or anticipated beneficial uses, and would not result in water quality lower than that specified in applicable water quality control plans (CVRWQCB, 1998). All aspects of the project alternatives would be subject to the Porter-Cologne Water Quality Control Act.

State Water Rights

California's system of water rights is referred to as a "dual system" in which both the riparian doctrine and the prior appropriation doctrine apply. Riparian rights result from the ownership of land bordering a surface water source (a stream, lake, or pond). These rights normally are senior in priority to most appropriative rights, and riparian landowners may use natural flows directly for beneficial purposes on riparian lands without a permit from the SWRCB.

Appropriative rights are acquired by diverting surface water and applying it to a beneficial use. Before 1914, appropriative rights could be obtained by simply diverting and using the water, posting a notice of appropriation at the point of diversion, and recording a copy of the notice with the county recorder. Since 1914, the acquisition of an appropriative right also requires a permit from the SWRCB.

The SWRCB is responsible for overseeing the water rights and water quality functions of the state. The SWRCB has jurisdiction to issue permits and licenses for appropriation from surface and underground streams. The California courts have jurisdiction over the use of percolating ground water, riparian use of surface waters, and the appropriative use of surface waters from diversions begun before 1914.

SWRCB Water Rights Decisions, Water Quality Control Plans and Water Quality Objectives

The Porter-Cologne Water Quality Control Act provides for the development and periodic review of water quality control plans (WQCP) that designate beneficial uses of California's major rivers and groundwater basins and establish narrative and numerical water quality objectives for those waters. Many of the permit terms and conditions contained in the WQCP for the Sacramento-San Joaquin Delta and Suisun Marsh and in water rights decisions implementing the WQCP have substantial influence on Delta operations, flows, water quality and ecosystem functions. The SWRCB adopts the Delta WQCP to establish standards to protect beneficial uses in the Delta.

Beneficial uses represent the services and qualities of a water body (i.e., the reasons why the water body is considered valuable), while water quality objectives represent the standards necessary to protect and support those beneficial uses. Beneficial uses are defined in Water Code section 13050(f) as including domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and the preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.

The SWRCB Water Rights Division has primary regulatory authority over water supplies and issues permits for water rights specifying amounts, conditions, and construction timetables for diversion and storage facilities. Water rights decisions implement the objectives adopted in the Delta WQCP and reflect water availability, recognizing prior rights and flows needed to preserve instream uses, such as water quality and fish habitat, and whether the diversion is in the public interest.

1995 Water Quality Control Plan and D-1641. The current WQCP in effect in the Delta is the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (1995 WQCP) (SWRCB, 1995). The 1995 WQCP identifies beneficial uses in the Delta to be protected, water quality objectives for the reasonable protection of beneficial uses, and a program of implementation for achieving the water quality objectives.

The 1995 WQCP was developed as a result of the December 15, 1994 Bay-Delta Accord, which committed the CVP and SWP to new Delta habitat objectives. The new objectives were adopted by amendment through a water rights decision (D1641) for CVP and SWP operations. One key feature of the 1995 WQCP was the estuarine habitat objectives ("X2") for Suisun Bay and the western Delta. The X2 standard refers to the position at which 2 parts per thousand salinity occurs in the Delta estuary, and is designed to improve shallow water fish habitat in the spring of each year. The X2 standard requires specific daily or 14-day salinity, or 3-day averaged outflow requirements to be met for a certain number of days each month from February through June. Other elements of the 1995 WQCP include export-to-inflow ratios intended to reduce entrainment of fish at the export pumps, Delta Cross Channel gate closures, minimum Delta outflow requirements, and San Joaquin River salinity and flow standards.

Basin plans adopted by RWQCBs are primarily implemented through the NPDES permitting system and issuance of waste discharge requirements to regulate waste discharges so that water quality objectives are met. Basin plans provide the technical basis for determining waste discharge requirements and taking regulatory enforcement actions if deemed necessary. A basin plan has been adopted for the Sacramento and San Joaquin River Basin (Region 5; CVRWQCB, 1998).

The Region 5 RWQCB has set water quality objectives for the surface waters in the Delta for the following substances and parameters: ammonia, bacteria, biostimulatory substances, chemical constituents, color, dissolved oxygen, floating material, oil and grease, pH, radioactivity, salinity, sediment, settleable material, suspended material, taste and odor, temperature, toxicity, and turbidity. In addition, Region 5 has adopted standards for pesticides. Specific objectives for concentrations of chemical constituents are also applied to bodies of water based on their designated beneficial uses (CVRWQCB, 1998; SWRCB, 1995).

Water quality objectives applicable to all groundwater have been set for bacteria, chemical constituents, radioactivity, taste, and odors, and in Region 5, have been set for toxicity (CVRWQCB, 1998; SWRCB, 1995).

Central Valley Regional Water Quality Control Board Drinking Water Policy

The CVRWQCB is in the process of a multi-year effort to develop a drinking water policy for surface waters in the Central Valley. Existing policies and plans lack water quality objectives for several known drinking water constituents of concern, including DBP precursors and pathogens, and also lack implementation strategies to provide effective source water protection. The CVRWQCB adopted Resolution No. R5-2004-0091 in July 2004, which supports the development of this policy. The new policy will culminate in the incorporation of new requirements into a Basin Plan amendment in 2009. The CVRWQCB Drinking Water Policy will apply to Delta waters and any activities, such as discharges, that affect Delta water quality.

Streambed Alteration Agreement Program

Under Sections 1600–1616 of the California Fish and Game Code, any person, business, state or local government agency, or public utility that proposes an activity that would (1) substantially divert or obstruct the natural flow, (2) substantially change use of any material from the bed, channel, or bank of any river, stream, or lake, or (3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake, is required to notify the California Department of Fish and Game (CDFG).

After such notification, the Streambed Alteration Agreement requires that the notifying entity and CDFG identify potential impacts of construction and mitigation measures required to minimize and avoid impacts. All portions of the project alternatives that would alter a waterway, including the new Delta intake, pipelines in areas of stream crossings, and the reservoir expansion, would be subject to the Streambed Alteration Agreement Program.

State Reclamation Board Approval

Any project encroaching into rivers, waterways, and floodways within and adjacent to federal- and state-authorized flood control projects or within designated floodways must receive approval from the state Reclamation Board. Under California Water Code sections 8534, 8608, and 8710–8723, the Reclamation Board is required to enforce, within its jurisdiction, on behalf of the State of California, appropriate standards for the construction, maintenance, and protection of adopted flood control plans that will best protect the public from floods.

The Reclamation Board's jurisdiction encompasses the entire Central Valley, including all tributaries and distributaries of the Sacramento and San Joaquin Rivers and Tulare and Buena Vista Basins. The Reclamation Board exercises jurisdiction over the levee section, the waterside area between project levees, a 10-foot-wide strip adjacent to the landward levee toe, the area within 30 feet of the top to the banks with no levees, and within designated floodways adopted by the Board. Construction of the new Delta intake and pump station would be subject to state Reclamation Board approval.

Los Vaqueros Project Water Right (Permit No. 20749)

SWRCB Decision 1629 (D1629) gives the terms and conditions governing Contra Costa Water District's (CCWD's) diversions to storage in Los Vaqueros Reservoir under Permit No. 20749. D1629 provides that CCWD may divert water under Permit No. 20749 from Old River to Los Vaqueros Reservoir from November through June during excess conditions in the Delta, as defined in the SWP/CVP COA, when those diversions will not adversely impact the operations of the SWP and CVP; CCWD may also divert water under its CVP water supply contract to storage in Los Vaqueros Reservoir. D1629 specifies the maximum diversion rates and annual diversion to storage by CCWD to Los Vaqueros Reservoir.

CCWD's operations are governed in part by the following three biological documents:

- 1993 National Marine Fisheries Service Biological Opinion for winter-run chinook salmon,
- 1993 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for Delta smelt, and

- 1994 Memorandum of Understanding between CDFG and CCWD regarding the Los Vaqueros Project.

The biological documents specify the following:

- **No-Fill Period** – CCWD will avoid filling Los Vaqueros Reservoir for 75 days each spring. The default no-fill period is March 15th through May 31st. This condition is also included in D1629.

- **No- Diversion Period** – CCWD will avoid Delta diversions for 30 days each spring, concurrent with part of the no-fill period. The default no-diversion period is the month of April. This condition is also included in D1629.

- **Emergency Storage** – The no-fill and no-diversion restrictions are in effect only when Los Vaqueros Reservoir is above emergency storage levels. Emergency storage is defined as 70,000 acre-feet (AF) in below-normal, above-normal, and wet years, and 44,000 AF in dry and critical years. This condition is also included in D1629.

- **X2 Restrictions** – Los Vaqueros Reservoir may be filled when X2 is west of Chipps Island in February through May, and Collinsville in January, June through August, and December. X2 restrictions on filling in December only exist when adult delta smelt are present at the Old River intake. In 2005, CDFG and USFWS granted a temporary waiver on the July and August X2 restrictions, allowing 5 years to evaluate bringing CCWD’s operating restrictions in line with D1641.

Mallard Slough Water Right

CCWD has a license and a permit for diversions at Mallard Slough for up to 26,780 AF per year. However, Mallard Slough diversions are unreliable during most of the year as a result of high salinity from seawater intrusion in the San Joaquin River at the point of diversion. Over the last 10 years, diversions by CCWD from Mallard Slough have averaged less than 3,000 AF per year. Diversions from Mallard Slough substitute for other diversions, principally CVP supplies from Rock Slough.

CVP Contract

On May 10, 2005, CCWD entered into a 40-year renewal of its contract with Reclamation for the delivery of up to 195,000 AF per year (Reclamation, 2005, Contract No. I75r3401A-LTR1, executed May 10, 2005). This water would be for municipal and industrial (M&I) uses and may be diverted at the Rock Slough, Old River, and Alternative Intake Project (AIP) intakes during any time of year, though diversions under this CVP contract are also limited by the no-fill and no-diversion periods described above.

Water Rights and Water Service Contracts

Each alternative may require changes to existing water right permits and licenses, which would be accomplished through change petitions to the SWRCB. Changes in water service contracts may also be required.

In addition to its long-term contract with Reclamation, CCWD has separate water rights for the Los Vaqueros Reservoir. CCWD's separate Los Vaqueros water rights are subject to permit terms and conditions to ensure they do not adversely affect the CVP and SWP operations under the water rights held by Reclamation and DWR, respectively. Under all these water system operations, the use of the collective water rights of the project participants would be coordinated to operate the existing and new facilities in a manner designed to accomplish the project objectives without adversely affecting SVP or SWP operations. This would be achieved through agreements among the parties and permit changes as necessary.

California Department of Health Services Drinking Water Regulations

DHS serves as the primary responsible agency for drinking water regulations. DHS must adopt drinking water quality standards at least as stringent as federal standards, and may also regulate contaminants to more stringent standards than U.S. EPA, or develop additional standards. DHS regulations cover over 150 contaminants, including microorganisms, particulates, inorganics, natural organics, synthetic organics, radionuclides, and DBPs. The specific regulations promulgated by DHS, in coordination with the U.S. EPA, are summarized in **Table 4.2-1**.

Local

Contra Costa County General Plan

The Contra Costa County General Plan provides several goals and policies related to water service and water resources. Specifically, the general plan includes the following provisions: assurance of potable water availability to residents (7-F); development of locally controlled water supplies to meet growth (7-G); conservation of water resources (7-H); flood control and flooding prevention (7-O-7-R); assurance of adequate long-term supply of water for domestic purposes as well as fishing, agricultural, and industrial uses (8-T); maintenance of ecology and hydrology of streams, creeks, and other natural waterways (8-U); and enhancement of opportunities for public accessibility and recreational use (9-43, 9-47). These goals and policies are shown in Appendix E-2.

Alameda County East County Area Plan

The Alameda County East County Area Plan also includes water-related goals and policies. These goals and policies include ensuring the mitigation of impacts on water quality caused by development near agricultural lands (76); protection of watershed land from the effects of development (110); the expansion of public facilities (218); the provision of an adequate, reliable, and safe water supply (253-254). Specific goals and policies are listed in Appendix E-1.

Sacramento River Basinwide and Regional Water Management Plans

In the mid-1990s, the Sacramento River Settlement Contractors, who held water rights higher in priority than the CVP water rights, initiated discussions with Reclamation for CVP contract renewals and prepared the *Sacramento River Basinwide Water Management Plan*. Finalized in 2004, this Plan identifies potential water management improvements, including subbasin-level management actions and system improvement/water use efficiency projects.

This planning process involved regional cooperation among the Sacramento River Settlement Contractors, other CVP contractors, government agencies, and stakeholders. The Sacramento Valley Water Management Agreement (described below) was prepared as a result of these coordination

TABLE 4.2-1
FEDERAL AND STATE DRINKING WATER REGULATIONS

Regulation	Promulgation Year	Contaminants Regulated
National Interim Primary Drinking Water Regulations	1975–1981	Inorganics, Organics, Physical, Radioactivity, Bacteriological
National Secondary Drinking Water Regulations	1979	Inorganics, Color, Corrosivity, Odor, Foaming Agents
Phase I Standards	1987	VOCs
Phase II Standards	1991	VOCs, SOCs, IOCs
Phase V Standards	1992	VOCs, SOCs, IOCs
Surface Water Treatment Rule	1989	Microbiological and Turbidity
Total Coliform Rule	1989	Microbiological
Lead and Copper Rule	1991 / 2003	Lead, Copper
Drinking Water Source Assessment and Protection Program	1996	Source Water Protection
Information Collection Rule	1996	Microbiological and Disinfectants / DBPs
Stage 1 Disinfectants/Disinfection Byproducts Rule	1998	Disinfectants / DBPs, Precursors
Interim Enhanced Surface Water Treatment Rule	1998	Microbiological, Turbidity
Unregulated Contaminant Monitoring Rule	1999	Organics, Microbiological
Radionuclides Rule	2000	Radionuclides
Arsenic Rule	2001	Arsenic
Filter Backwash Rule	2002	Microbiological, Turbidity
Drinking Water Candidate Contaminant List	2003	Chemical, Microbiological
Stage 2 Microbiological and Disinfection Byproducts Rules	2006	Microbiological and Disinfectants / DBPs
Secondary Maximum Contaminant Levels	2006	Metals, Color, Foaming Agents, MTBE, Odor, Thiobencarb, Turbidity, TDS, and Anions
Primary MCL for Perchlorate	2007	Perchlorate
Interim Enhanced Surface Water Treatment Rule	2008	Microbiological and Turbidity

DBP = Disinfection by-product
IOC = Inorganic Compound
MCL = Maximum Contaminant Level
MTBE = methyl tertiary-butyl ether
SOC = Synthetic Organic Compound
TDS = Total Dissolved Solid(s)
VOC = Volatile Organic Compound

efforts. The Sacramento River Settlement Contractors and Reclamation are currently cooperating to finalize a regional water management plan that will encourage further regional and subbasin coordination, including meeting the CALFED-targeted benefits and establishing quantifiable objectives associated with numerous projects.

Sacramento Valley Water Management Agreement and Integrated Regional Water Management Plan

In addition to the planning efforts undertaken by CVP contractors and Reclamation as described above, a broader multi-agency process is underway.

In July 1998, the SWRCB conducted a water-rights hearing to consider how to implement the 1995 WQCP (described above). As a result of the hearing, responsibility for implementing the 1995 WQCP objectives was allocated to water-right holders, since they were affecting Delta inflows, diversions, and exports.

More than 40 water suppliers in the Sacramento Valley negotiated and entered into the Sacramento Valley Water Management Agreement with Reclamation, DWR, USFWS, CDFG, and the State Water Contractors. Signed in 2002, the agreement describes the need for a cooperative regional approach to improve local, regional, and statewide water supply reliability and quality, while providing supplies to help implement water quality standards in the Delta. Its proposed implementation will offer relief to water-short areas of the Sacramento Valley, provide additional water supplies for the Delta, and support water transfers to CVP and SWP users. CCWD was a signatory to the initial agreement, as a separate party.

The *Sacramento Valley Integrated Regional Water Management Plan* (IRWMP) was released in December 2006. The IRWMP objectives are to improve the economic health of the region; improve regional water supply reliability for local water users, the region, and California; improve flood protection and floodplain management; improve and enhance water quality; and protect and enhance the ecosystem. The Sacramento Valley Water Management Agreement and the IRWMP are relevant to the Los Vaqueros project because they have implications for Delta hydrology and water quality.

Environmental Setting

Surface Water Hydrology

Surface water hydrology within the Sacramento–San Joaquin Delta, the Sacramento River, and the San Joaquin River is discussed below. For this discussion, a diversion is defined as a withdrawal of water from the water body in question; an export is defined as water that is diverted and removed from the Delta area by the CVP or SWP for south-of-Delta use; and Delta outflow is water that flows out of the Delta to the San Francisco Bay and Pacific Ocean.

Sacramento River

Flows within the Sacramento River are highly regulated and are influenced by the following factors: runoff from precipitation and snowmelt; natural variation; upstream water storage facilities; water diversions for agricultural, municipal, and industrial purposes; agricultural and municipal discharges; and a flood damage reduction system that includes levees, floodplains (the Yolo, Sutter, and Colusa bypasses), and weirs. These features contribute to observed flows within the Sacramento River.

Sacramento River flows vary substantially on a seasonal and year-to-year basis. Seasonally, flows in the river may vary as a result of runoff from local tributaries and releases from the major water storage reservoirs, as well as diversions by agricultural, municipal, and other users. Interannually, river flows vary according to precipitation, the volume of carryover storage in reservoirs, and releases to downstream water users.

The Sacramento River enters the Delta (as defined by California Water Code Section 12220) at Freeport, where the average annual flow is about 16 million acre-feet (MAF). **Figure 4.2-1** presents the average monthly flows of the Sacramento River at Freeport for the period of record. Additional Sacramento River flow enters the Yolo Bypass upstream of Freeport, then rejoins the river and flows into the Delta downstream of Freeport.

San Joaquin River

Flows within the San Joaquin River are highly regulated and influenced by the following factors: runoff from precipitation and snowmelt; natural variation; upstream water storage facilities; water diversions for agricultural, municipal, and industrial purposes; agricultural and municipal discharges; and a flood damage reduction system. These features contribute to observed flows within the San Joaquin River. The average annual flow of the San Joaquin River as it enters the Delta at Vernalis is about 2.6 MAF, or 3,600 cubic feet per second (cfs). **Figure 4.2-2** presents the average monthly flows of the San Joaquin River at Vernalis for the period of record.

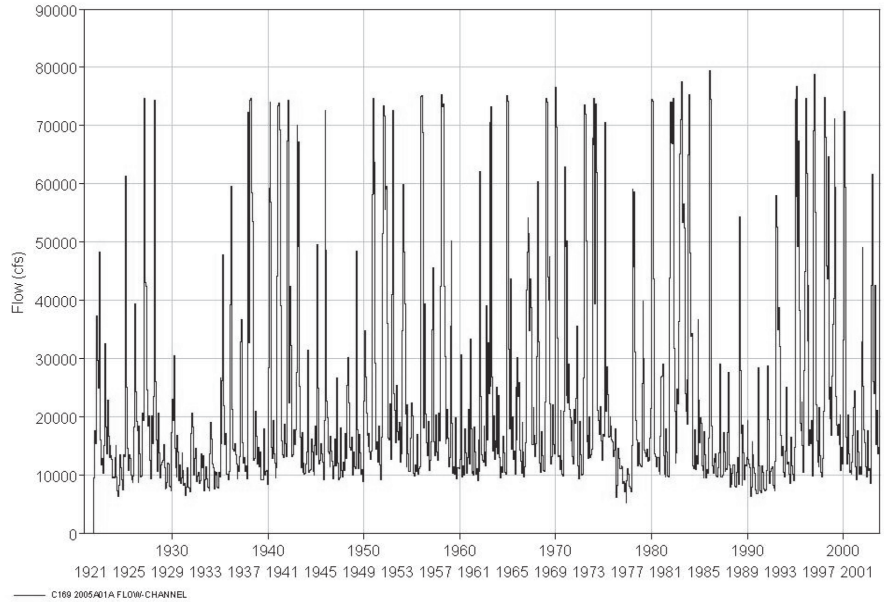
Typically, during summer months, flows within the lower San Joaquin River are composed primarily of agricultural and wildlife refuge return flows and municipal discharges. Portions of the middle/lower San Joaquin River below Friant Dam typically run dry during the dry season, resulting in a temporary hydrologic disconnect between the lower and upper watersheds.

Sacramento–San Joaquin Delta

The Sacramento-San Joaquin Delta, to the east of San Francisco Bay, represents the point of discharge for the Sacramento-San Joaquin River system. Water flows out of the Delta, into San Francisco Bay, and through the Golden Gate to the Pacific Ocean, creating an extensive estuary where salty ocean water and fresh river water commingle. In sum, water from over 40 percent of the state’s land area is discharged into the Delta.

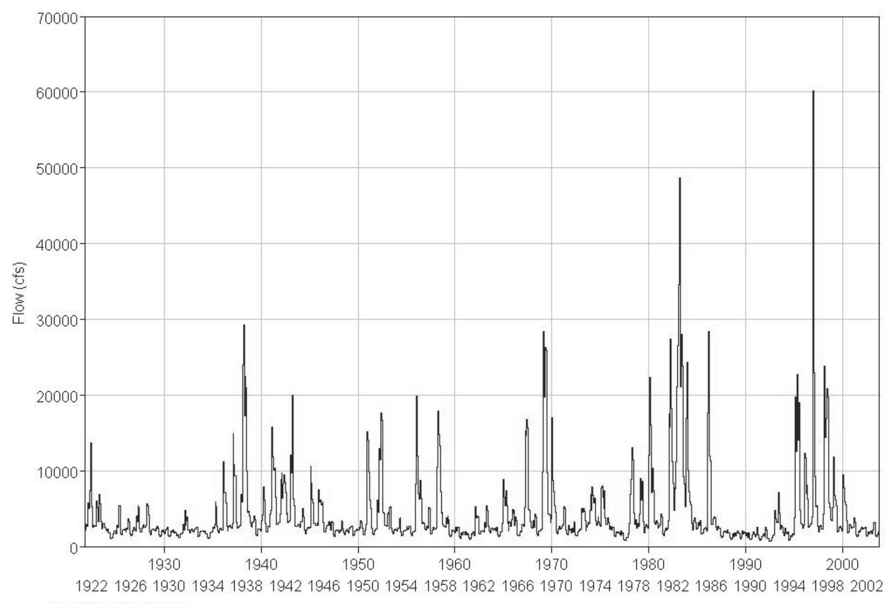
The Delta supports several beneficial uses, including water supply to local and south of Delta municipalities and agricultural uses, ecological support for fisheries including wetlands and important habitat, in-Delta agriculture, flood management, water quality management, and a major conveyance for transporting fresh water from northern to southern portions of the state (Delta Vision, 2007; DWR, 2008). However, many water projects, including export pumps for the SWP and CVP, diversions for Delta-area and Bay-area municipalities, and regional agricultural users, also divert Delta waters, and thereby influence Delta hydrology and water quality.

Figure 4.2-3 shows a map of the Delta, including features relevant to the following discussion of Delta hydrology and water quality.



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-1
Existing Average Monthly
Sacramento River Flow at Freeport



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-2
Existing Average Monthly
San Joaquin Flow at Vernalis

SOURCE: ESRI, 2006; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.2-3
Sacramento-San Joaquin Delta Overview

Delta Hydrology and Hydrodynamics

The primary factors that affect Delta hydrology are: (1) twice-daily tidal cycles, which result in inflow and outflow through the Delta and San Francisco Bay, (2) freshwater inflow from the Sacramento and San Joaquin Rivers, and (3) water management activities, including SWP and CVP reservoir storage and releases, as well as water exports from the south Delta. Additionally, winds and salinity/freshwater mixing generate a number of secondary currents. While these currents are generally of low velocity, they are significant in terms of transporting contaminants and mixing different sources of water.

Tidal Cycles. Twice-daily tides push water back and forth between San Francisco Bay and the Delta. Over each tidal cycle, ebb flows draw water downstream from the Delta towards San Francisco Bay, while flood tides push bay water upstream and into the lower portions of the Delta. The average peak tidal flow is about 350,000 cfs at Chipps Island (the interface between the Delta and Suisun Bay). Because daily tidal inflows are about equal to daily tidal outflows, the tidal cycle can be described as having a sloshing or mixing effect within the Delta. Tidal flows are far larger than any other flows in the Delta. For example, the current combined export capacity from the south Delta is about 15,000 cfs, and estimated average monthly net Delta outflow is about 32,000 cfs in winter and about 6,000 cfs in summer (CALFED, 2000).

Delta Inflow. Inflows of freshwater to the Delta are derived primarily from the Sacramento and San Joaquin Rivers, although some additional inflow is provided by the Mokelumne, Calaveras, and Cosumnes Rivers along the eastern Delta. Sacramento River flows, including those routed through the Yolo Bypass, account for an annual average of about 80 percent of total Delta inflow. The San Joaquin River provides about an additional 15 percent, while flows from eastside tributaries account for the remainder; about 5 percent (DPC, 2000; DWR 2008).

An average of about 21 MAF of fresh water reaches the Delta every year from a combination of these freshwater inflow sources. However, interannual variation in flow can be substantial: in 1977, a year of extraordinary drought, Delta inflow totaled only 5.9 MAF, while in 1983, an exceptionally wet year, Delta flow reached about 70 MAF. Delta inflow in dry and critically dry years averages about 12 MAF annually.

In combination with an extended period of drought, historic upstream diversions reduced inflow to a point in the 1920's that salinity intrusion in the Delta became a problem (Means, 1928), necessitating construction of reservoirs to help manage water supplies and salinity.

Delta Outflow. The water that flows into the Delta may be diverted by water users within the Delta area, exported by CVP and SWP pumps, or left to flow out through San Francisco Bay and into the Pacific Ocean. Flows into the Delta may also be augmented by local precipitation and runoff, local drainage and seepage, and flows from local wastewater treatment plants. Delta outflow is the net flow of water from the Delta into San Francisco Bay.

Figure 4.2-4 provides a comparison of average monthly Delta inflow and outflow for wet, above normal, below normal, dry, and critical water years, according to Sacramento Valley hydrology. Delta inflow and outflow exceedance curves are shown in **Figure 4.2-5**. As indicated, Delta outflow is influenced by diversions, and is therefore noticeably less than inflow during most periods. However, during peak flow conditions exceeding 100,000 cfs, diversions from the Delta represent a much smaller percentage of total Delta inflow, and Delta inflow is much closer in rate to Delta outflow.

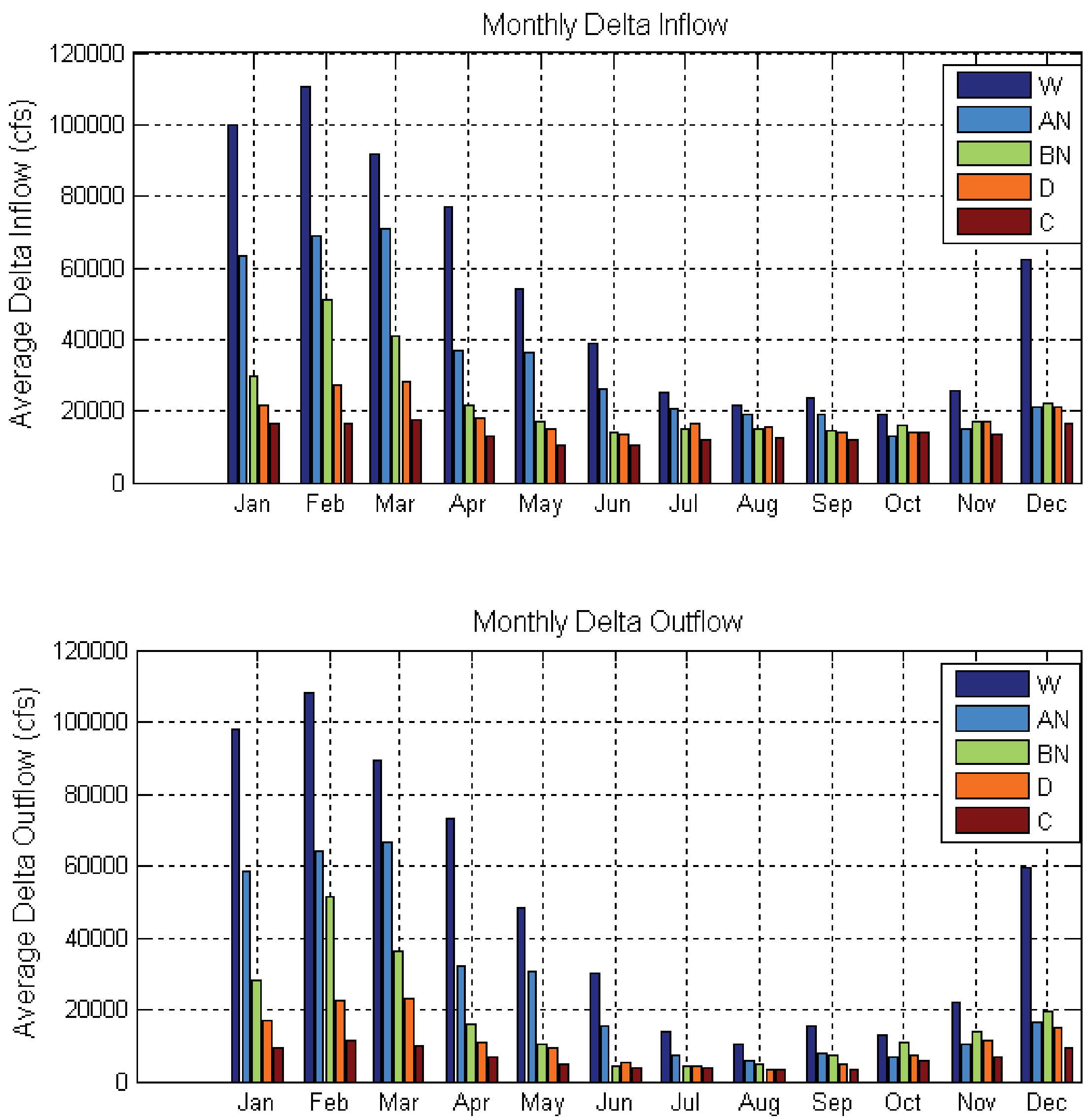


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Figure 4.2-4
Delta Inflow and Outflow by Water Year Type

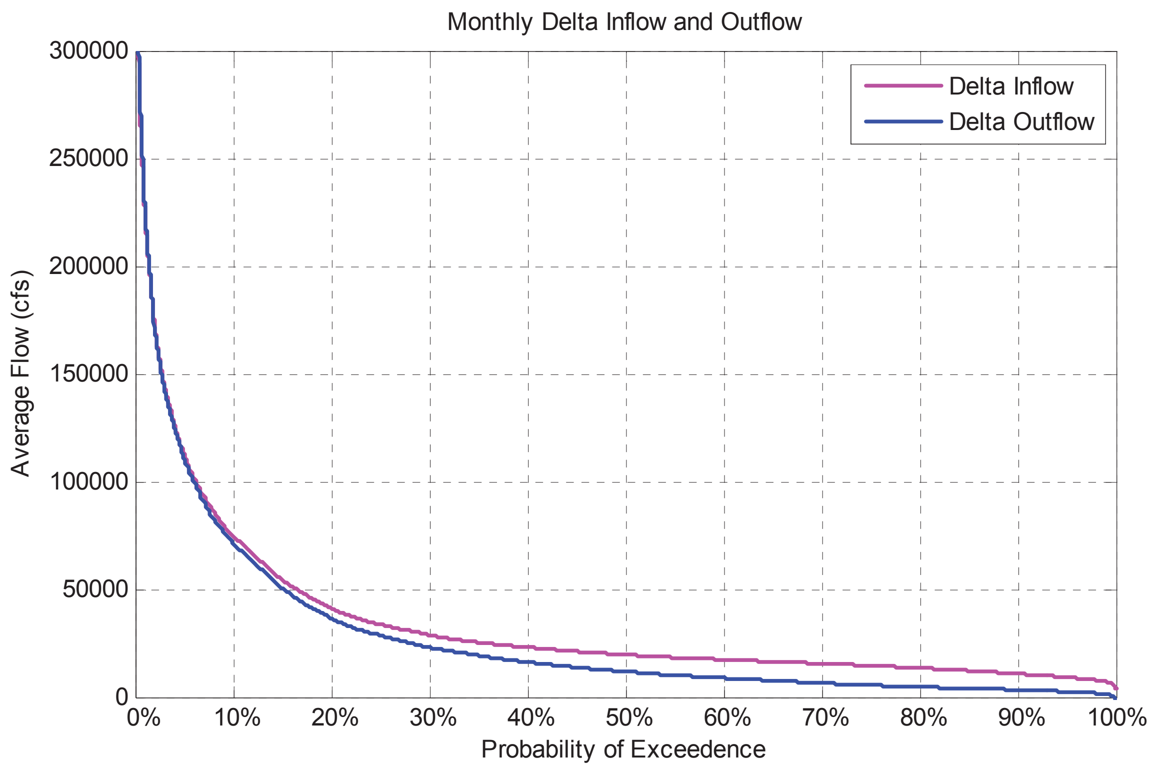

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Figure 4.2-5
Delta Inflow and Outflow Exceedance Curves

Together, local diversions and water exports in the Delta account for an average of about 35 to 40 percent of total Delta inflow (CALFED, 2000), with the remaining 60 to 65 percent flowing out of the Delta to the Pacific Ocean. The total diversions and exports from the Delta include use by in-Delta agricultural users (about 10 percent of average inflow), the CVP and SWP pumping facilities (about 25 to 30 percent of average inflow), and CCWD diversions (less than 1 percent of average inflow). An additional 20 percent of average Delta inflow provides minimum outflow for salinity control and to meet outflow requirements for protecting fishery resources, and the remaining approximately 40 to 45 percent of average Delta inflow provides Delta outflow to the Pacific Ocean beyond that needed to meet salinity standards.

Water Management Activities. The CVP and SWP are the largest users and exporters of Delta water. Water is exported via pumping and aqueduct facilities at Clifton Court Forebay, the Jones Pumping Plant, and the North Bay Aqueduct. Local agencies, including CCWD, municipalities, private entities, and agricultural users also operate their own diversion programs and infrastructure, independent of the CVP and SWP. Examples include the approximately 1,800 agricultural diversions within the Delta, and diversion projects such as the Freeport Regional Water Authority Project (under construction) and the proposed Stockton Delta Water Supply Project (Stockton DWSP). Surface water infrastructure associated with the CVP, SWP, and local diversions is discussed in greater detail below.

Water management activities, especially export pumping, can affect the direction of flow in Delta channels. Under natural conditions, net flow of Delta waters is westward from the San Joaquin and Sacramento Rivers, across the Delta and towards San Francisco Bay. However, under certain tidal, river inflow, and south Delta export pumping conditions, net reverse flows may occur over a tidal cycle in specific western Delta so that the net flow direction in those channels is eastward. QWEST is a parameter that represents the estimated net westward flow of the San Joaquin River at Jersey Point that is used as a measure of net reverse flow conditions (exclusive of tides) within certain Delta channels.

As QWEST decreases, reverse flows in some Delta channels increase. CVP and SWP export pumping can also cause reverse flows in the southward direction down Old and Middle Rivers and other central and south Delta channels. Figure 4.2-3 shows the locations of the San Joaquin River, Jersey Point, and other features of the Delta.

Surface Water Infrastructure

The surface water infrastructure along the Sacramento and San Joaquin Rivers, in the Delta, and south of the Delta, supports storage, conveyance, and export of water throughout much of California. Operation of this infrastructure, which includes reservoirs, diversions, and conveyances, substantially affects Delta hydrology.

Central Valley Project Facilities

The CVP, which is administered by Reclamation, stores and transports water from the Delta for irrigation use in the San Joaquin Valley, and for municipal use in CCWD's service area and elsewhere. In total, the CVP is composed of some 20 reservoirs with a combined storage capacity of over 11 MAF, 11 power plants, and over 500 miles of canals and aqueducts. The CVP serves multiple purposes, including flood control; navigation; water supply for irrigation and domestic uses; fish and wildlife protection, restoration, and enhancement; and power generation. The following text provides a description of the major components of the CVP, as relevant to the project alternatives.

Trinity River Diversion (North of Delta). The Trinity River Diversion includes Trinity Dam and facilities to transfer water from the Trinity River basin to the Sacramento River basin. Water is conveyed from Trinity Dam, which has a capacity of about 2.4 MAF, via the Clear Creek Tunnel, to Keswick Dam on the Sacramento River below Shasta Dam. Trinity Reservoir is operated for water storage and flood control, consistent with the DWR Division of Safety of Dams guidance. The outflow from Trinity Reservoir also provides water to meet temperature objectives for special-status species in the Trinity and upper Sacramento Rivers.

Shasta Reservoir (North of Delta). Shasta Reservoir, which provides up to about 4.5 MAF of water storage capacity, is on the upper Sacramento River, about 5 miles north of the city of Redding. The watershed that is drained into Shasta Reservoir encompasses about 6,600 square miles of land. Inflows to the reservoir vary both annually and seasonally, with inflows typically peaking in March during the springtime snowmelt. After the spring snowmelt has ended, typical June through October flow into the reservoir is less than 5,000 cfs. About 1.3 MAF of storage space is reserved for flood control, which is managed by the USACE.

Releases from Shasta Reservoir and Keswick Reservoir (which is just downstream of Shasta Reservoir) are managed to meet minimum fish flows and temperature requirements, flood control requirements, salinity control, and water supply demands of CVP contractors (Reclamation and DWR, 2003).

Folsom Reservoir (North of Delta). Folsom Reservoir has a maximum capacity of about 1 MAF, and is on the American River about 15 miles northeast of Sacramento, near the city of Folsom. The dam is managed to provide flood control, recreation, power, water supply, Delta water quality protection, and minimum fish protection flows in the American River and Delta.

New Melones Reservoir (East of Delta). The New Melones Reservoir is on the Stanislaus River and is the fifth largest reservoir in California, with a capacity of 2.4 MAF. The reservoir provides flood control for the lower Stanislaus River and San Joaquin Delta, irrigation and municipal water supplies, peak use period hydrologic production, recreation, and fish and wildlife enhancement. New Melones Reservoir is also used to provide salinity control at Vernalis and interior Delta water quality compliance locations. The New Melones Reservoir is overseen and operated by Reclamation.

Jones Pumping Plant (Delta Area). The Jones Pumping Plant is the CVP's primary diversion facility in the south Delta, and has a capacity of 4,600 cfs. The Jones Pumping Plant provides water to the Delta-Mendota Canal, which supplies water for storage in the San Luis Reservoir and for use within the San Joaquin Valley. On average, the Jones Pumping Plant exports about 3,350 thousand acre-feet (TAF) of water per year.

Contra Costa Canal (Delta Area). The Contra Costa Canal has its origin on Rock Slough, and consists of a 4-mile earth-lined intake canal (currently being converted to a pipeline to improve water quality and reduce flood risks), four pump stations with a capacity of 350 cfs, and a 44-mile concrete-lined canal. The canal was constructed and is owned by Reclamation, and is operated and maintained by CCWD. The canal is used to serve water to CCWD's customers.

San Luis Reservoir (South of Delta). San Luis Reservoir is a shared facility between the CVP and the SWP. It is near Los Banos, and has a storage capacity of about 2 MAF. This pumped-storage reservoir provides seasonal storage of water exported from the Delta, including 966 TAF of CVP storage. Water is conveyed from San Luis Reservoir into federal and state aqueducts serving the San Joaquin Valley and other agricultural and municipal areas south of the Delta. Deliveries from San Luis Reservoir also flow west through Pacheco Pumping Plant and Conduit to the San Felipe Division of the CVP, which includes the SCVWD and San Benito Water District. Water in San Luis Reservoir is managed to meet water supply demands of SWP and CVP contractors.

State Water Project Facilities

The SWP, which is operated and maintained by DWR, stores and transports water for agricultural and M&I use within the Feather River area, the San Francisco Bay Area, the San Joaquin Valley, southern California, and the central California coast. In total, the SWP is composed of 32 reservoirs and storage facilities, 17 pumping plants, eight hydroelectric power plants, and over 660 miles of aqueducts and pipelines. The SWP serves over two-thirds of California's population, including about 600,000 acres of farmland. The SWP serves multiple purposes including providing water supply to contracting agencies, flood control, recreation, fish and wildlife enhancements, power generation, and salinity control within the Delta. The following text provides a description of the major SWP components, as relevant to the project alternatives.

Oroville Reservoir (North of Delta). The Oroville Reservoir, which has a maximum water storage capacity of about 3.5 MAF, is the primary SWP storage reservoir. It is on the Feather River near the city of Oroville and the Thermalito Forebay and Afterbay. Inflow to the reservoir is strongly influenced by snowmelt and rainfall runoff during the winter and spring, and results primarily from base flows (i.e., flows in a river or stream that occur in the absence of any recent rainfall) during the summer and autumn. Monthly flows from January through June are typically greater than 2,000 cfs, while summer flows are typically at least 1,000 cfs. A minimum release of at least 600 cfs is maintained during all months to provide adequate flows and water quality to meet fish requirements (Reclamation and DWR, 2003).

Releases from Oroville Reservoir and Thermalito Afterbay are managed to meet minimum fish flows and temperature requirements, flood control requirements, navigation control point requirements, Delta water quality requirements, and water supply demands of SWP contractors.

Banks Pumping Plant (Delta Area). The SWP Banks Pumping Plant supplies water for the South Bay Aqueduct and the California Aqueduct, and has an installed capacity of 10,300 cfs. However, under current operational constraints, inflow to Clifton Court, which is the forebay to the Banks plant, is often limited to a maximum of 6,680 cfs. The 6,680 cfs limitation is removed from December 15th through March 15th, when exports may be increased by 33 percent of San Joaquin River inflow to the Delta, as long as San Joaquin River inflow is at least 1000 cfs. In addition, a temporary permit was issued to pump an additional 500 cfs at Banks Pumping Plant from July 1 through September 30 of each year to provide water for Environmental Water Account purposes.

Barker Slough Intake for the North Bay Aqueduct (Delta Area). In addition to the pumps at Clifton Court, the SWP also pumps water from Barker Slough into the North Bay Aqueduct for use within the Bay region. The Barker Slough Pumping Plant, just upstream of the confluence of Barker Slough and Lindsey Slough, pumps water into a 27-mile underground pipeline that connects to the North Bay Aqueduct. The pumping plant and North Bay Aqueduct supply SWP water to parts of Solano and Napa Counties north of San Francisco Bay (CALFED, 2000).

San Luis Reservoir (South of Delta). San Luis Reservoir is a shared facility between the CVP and the SWP. It is near Los Banos, and has a storage capacity of about 2 MAF. This pumped-storage reservoir provides seasonal storage of water exported from the Delta, including 1,062 TAF of SWP storage. Water is conveyed from San Luis Reservoir into federal and state aqueducts serving the San Joaquin Valley and other agricultural and municipal areas south of the Delta. Water in San Luis Reservoir is managed to meet water supply demands of SWP and CVP contractors.

Other Facilities

CCWD Diversion Intakes. CCWD owns and operates three screened intakes; these are the Mallard Slough Intake (39 cfs), Old River Intake and Pump Station (250 cfs), and the AIP on Victoria Canal (250 cfs), which is currently under construction. Reclamation owns and CCWD operates the Contra Costa Canal with its intake on Rock Slough (350 cfs), described above. Together, the current average annual diversion from all of CCWD's intakes combined is about 125 TAF.

Delta Agricultural Diversions. The Delta includes about 540,000 acres of agricultural land which, during the summer irrigation season, is supplied by surface water from the Delta. To satisfy these surface water demands, agricultural users operate their own diversions at over 1,800 locations and divert at a combined net rate (diversions less drainage returned to the Delta) estimated at over 4,000 cfs, for a total of about 1.5 MAF of water consumed annually. This diversion rate is relatively close in magnitude to summer Delta exports of either the Banks Pumping Plant or the Jones Pumping Plant. Water diverted by Delta agricultural users may be used for irrigation, or to leach accumulated salts from fields. Agricultural tailwater, including tailwater resulting from leaching of accumulated salts, is collected by systems of canals within the Delta islands, and pumped back into Delta waterways. A portion of the water diverted from Delta waterways for agricultural use is thereby returned to Delta waterways; consequently, actual diversions exceed the net water consumed by as much as 50 percent or more. However, agricultural island discharge water typically has elevated concentrations of salts and organic carbon.

Joint Water Project Operations for Hydrology, Water Quality, and Ecosystems

Operation of the CVP and SWP is coordinated according to their respective water right permits, and a series of other governing laws, regulations, and agreements that have been developed to ensure compliance with specific hydrology, water quality, and ecosystem requirements while meeting the water supply contract obligations. CVP and SWP operations are adjusted to meet Delta flow and water quality standards by increasing releases of stored water in project reservoirs, or altering export pumping, gate positions, and other Delta facility operations.

Water Rights Decision-1641 and Order WR 2001-05 contain the current water right requirements for Reclamation and DWR to implement the WQCP flow and water quality objectives. The COA (described above) defines how Reclamation and DWR share their joint responsibility to meet Delta water quality standards and meet the water demands of senior water right holders.

Depending on specific conditions of the fisheries populations and presence in the Delta each year, CVP/SWP exports can be restricted on a seasonal basis pursuant to biological opinions issued by the National Marine Fisheries Service and USFWS. The assumptions used in the analysis for governing CCWD, CVP, and SWP operations are discussed in more detail in Section 3.1.2. Related operational considerations that have been incorporated into the analysis for the Los Vaqueros Reservoir Expansion Project are discussed below.

Surface Water Quality

The following text provides a description of relevant and applicable surface water quality constituents, and then describes the existing surface water quality conditions within the Delta and the Sacramento and San Joaquin Rivers.

Water Quality Constituents

The following water quality constituents are found within the Delta and San Joaquin and Sacramento Rivers, and contribute to existing water quality conditions within the Sacramento-San Joaquin River-Delta system. The constituents listed below represent only a few of all the constituents of concern for drinking water that are present in the Sacramento-San Joaquin River-Delta system, and were selected because of their relevance to the project alternatives and availability of comprehensive data. Salinity in particular is the constituent most likely to be affected by shifts in the timing and location of pumping in the Delta, and is also the constituent for which the most monitoring data and calibrated Delta modeling tools are available.

Salinity

Salinity refers to the concentration of salts or ions present in water, including sodium, magnesium, calcium, phosphates, nitrates, potassium, Cl, bromide, and sulphate. Salinity measures commonly used for Delta waters include TDS and Cl concentrations, both measured in milligrams per liter (mg/L).

Salinity is both an aesthetic (taste) and a health issue for drinking water quality. High salinity adversely affects drinking water taste, landscape irrigation, and industrial and manufacturing processes. Salinity is particularly problematic because it cannot be removed via conventional drinking water treatment processes, and the EPA has implemented a secondary (i.e., recommends but does not require compliance) maximum contaminant level for TDS of 500 mg/L. Additionally, CCWD has established a water quality delivery objective for Cl, a constituent of salinity, of 65 mg/L. Health impacts of bromide, another constituent of salinity, are discussed below.

Organic Carbon

Organic carbon is composed of naturally occurring organic matter from plants and animals. Two forms of organic carbon occur in surface waters: (1) dissolved organic carbon (DOC), which is organic carbon that cannot be removed from water by a 0.45-micron filter; and (2) total organic carbon (TOC), which is a measure of all the organic carbon in the water, including DOC and organic carbon from particulate matter such as plant residues.

Organic carbon is a DBP precursor that causes problems during the drinking water treatment process. Organic carbon reacts with chlorine during the disinfection process to form trihalomethanes, haloacetic acids, and other toxic compounds. As a result, CCWD and many other agencies that rely on the Delta for water supply have changed to ozone disinfection. High levels of organic carbon in Delta water require increased ozone dosages during the disinfection process at CCWD's two water treatment plants. This can, in turn, potentially result in increased formation of bromate in treated water. Drinking water regulations specify a required level of reduction for organic carbon based on source water concentrations.

Sacramento–San Joaquin Delta

The Delta, which is an estuarine environment, contains a mix of fresh water and saltwater. In general, downstream areas of the Delta contain saltier water, while upstream areas contain fresher water. The location at which Delta waters become saline is largely dependent on the rate of net outflows from the Delta, which is determined primarily by inflows, local diversions, and exports. High flows push saltwater towards the San Francisco Bay, while lower outflow rates allow saltwater to intrude upstream farther into the Delta.

The release of water from storage in Lakes Shasta, Folsom, and Oroville has controlled saltwater intrusion into the Delta during summer and fall months. Flows from the eastside streams and the San Joaquin River system also contribute to controlling saltwater intrusion. In general, peak winter and spring flows have been reduced by upstream storage and diversions, and summer and fall flows have been augmented. During very wet years, reservoirs are unable to control runoff, and salinity in the northern portions of San Francisco Bay is reduced to freshwater concentrations (CALFED, 2000).

Delta flows and water quality are specifically controlled or influenced by the following factors:

- Inflow of fresh water from tributary rivers, as influenced by upstream reservoirs, diversions, and other infrastructure and management activities
- In-Delta diversions for export and local use, including CCWD, CVP and SWP pumping
- Upstream agricultural return flows
- Upstream and in-Delta wastewater treatment plant discharges
- In-Delta agricultural discharges resulting in elevated concentrations of total organic carbon and salts, which result from contact with peat-rich Delta soils and evaporative concentration, respectively
- Discharges from Delta agricultural islands may also have elevated concentrations of nutrients, suspended solids, organic carbon, boron, and pesticides
- Tidal action that forces high-salinity seawater, including bromide associated with seawater, from Suisun and San Francisco Bays into the lower Delta
- Heavy metals, including cadmium, copper, mercury, and zinc, which continue to enter the Delta. Sources of these metals include runoff from abandoned mine sites, tailing deposits, downstream sediments where metals have been deposited over the past 150 years, urban runoff, and industrial and municipal wastewater.

The factors that most influence Delta water quality can differ by location. The north Delta tends to have better water quality in terms of salinity, in large part a result of low salinity water inflow from the Sacramento River. The quality of water in the west Delta is strongly influenced by tidal exchange with San Francisco Bay. During low-flow periods, seawater intrusion results in increased salinity. In the south Delta, water quality tends to be poorer because of the combination of low inflows of lower quality water from the San Joaquin River, agricultural return flows that are pumped from Delta islands into Delta channels, and the effects of seawater intrusion from San Francisco Bay.

Table 4.2-2 identifies current mean concentrations of selected constituents at various locations in the Delta. These and other water quality parameters relevant to Delta water quality are described in the following paragraphs. For reference, a map of the Delta is presented as Figure 4.2-3. Review of these water quality data indicates that higher levels of the constituents related to salinity tend to occur toward the southern and western portions of the Delta.

TABLE 4.2-2
WATER QUALITY FOR SELECTED STATIONS IN THE DELTA

Location	Mean TDS (mg/L)	Mean EC (µS/cm)	Mean Chloride (mg/L)	Mean Bromide (mg/L)	Mean DOC (mg/L)
Sacramento River at Greene's Landing	100	160	6.8	0.018	2.5
North Bay Aqueduct at Barker Slough	192	332	26	0.015	5.3
Clifton Court Forebay	286	476	77	0.269	4.0
Jones Pumping Plant	258	482	81	0.269	3.7
CCWD Intake at Rock Slough	305	553	109	0.455	3.4
San Joaquin River at Vernalis	459	749	102	0.313	3.9

NOTE: The sampling period varies, depending on the location and constituent, but generally is between 1990 and 1998.

TDS = total dissolved solids
DOC = dissolved organic carbon
µS/cm = micro Siemens per centimeter
EC = electrical conductivity
mg/L = milligrams per liter

SOURCE: CALFED, 2000.

Delta Salinity

Salinity (defined above) varies across the Delta, and results from a combination of mineral loads from river inflows, saline water intrusion from the San Francisco Bay, and agricultural tailwater and wastewater treatment plant outfalls within the Delta. Table 4.2-2 shows that mean TDS concentrations are highest in the west Delta and in south Delta channels that receive water from the San Joaquin River (CALFED, 2000).

Saline water intrusion from the San Francisco Bay primarily affects the western Delta. Daily tidal cycles force saline water into and out of the Delta, with the extent of intrusion determined by tidal height, freshwater inflow from the Sacramento, San Joaquin, and east-side rivers, the rate of pumping at Delta water intakes, and the operation of various flow control structures (e.g., Delta Cross-Channel Gates and Suisun Marsh Salinity Control System; DWR, 2001).

In addition to varying geographically within the Delta, salinity varies seasonally depending on the quantity and quality of freshwater inflows and water operations. During winter and early spring, flows through the Delta are usually above the minimum levels required to control salinity. During the summer and autumn, salinity in the Delta may increase because of decreased inflows or discharges from agricultural runoff. Additionally, decreased inflow during the late summer can lower Delta outflow and, combined with high exports, result in increased net reverse flow and increased saltwater intrusion into the Delta.

The Sacramento and San Joaquin Rivers contribute about 61 percent and 33 percent, respectively, to tributary inflow salinity loads within the Delta. Sacramento River salt concentration is relatively low, but because of its large volumetric contribution, the river contributes the majority of the salt load supplied by tributary inflow to the Delta (DWR, 2001). Flow from the San Joaquin River is lower than flow from the Sacramento River, but the salt concentrations in San Joaquin River water average about seven times those of the Sacramento River. Return flows to the Delta from agricultural islands also contribute salt to Delta waterways.

CVP and SWP exports and pumping can influence the direction of flow at various locations throughout the Delta, and thereby have the potential to affect Delta salinity. Operation of the Banks and Jones Pumping Plants draws high-quality Sacramento River water across the Delta and restricts the low-quality area to the southeast corner (CALFED, 2000; SWRCB, 1997). Each portion of the Delta is dominated by different hydraulic variables, and salinity therefore varies within different sections of the Delta.

Figure 4.2-6, **Figure 4.2-7**, and **Figure 4.2-8** illustrate the seasonal variation in salinity. Salinity generally shows a consistent increase in concentration from about August through December; salinity during these months is much higher than during the other parts of the year. The increase in concentration is still evident at the Middle River sample location near Highway 4, but the overall concentration levels are lower than at the other two testing sample locations. The salinity at Middle River, which is east of the two other stations, is typically lower than the salinity at the two Old River sampling locations in the summer and fall. This is consistent with the southern and western portions of the Delta being saltier than the northern and eastern portions. Salinity control and monitoring is the responsibility of the CVP and SWP, and is regulated by the SWRCB. Salinity is monitored because water diverted and exported from the Delta is used for a variety of municipal, industrial, and agricultural uses (CALFED, 2000; SWRCB, 1997). Salinity control in the Delta is necessary because the Delta is influenced by the ocean, and because Delta water channels are at or below sea level. Unless forced back by a continuous seaward flow of fresh water, seawater will advance into the Delta and degrade water quality. Salinity varies geographically and seasonally within the Delta and varies depending on water-year type (CALFED, 2000; SWRCB, 1997).

Bromide

Bromide is an important component of salinity because it reacts with natural organic compounds in the water to form DBPs such as trihalomethanes, haloacetic acids (HAAs), and bromate during disinfection of drinking water. Four types of trihalomethane compounds are regulated in drinking water: chloroform, bromodichloromethane, dibromochloro-methane, and bromoform, as well as total HAAs. CCWD established a source water quality goal of 50 micrograms per liter (μg/L) for bromide on the basis of a 1998 study by the California Urban Water Agencies.

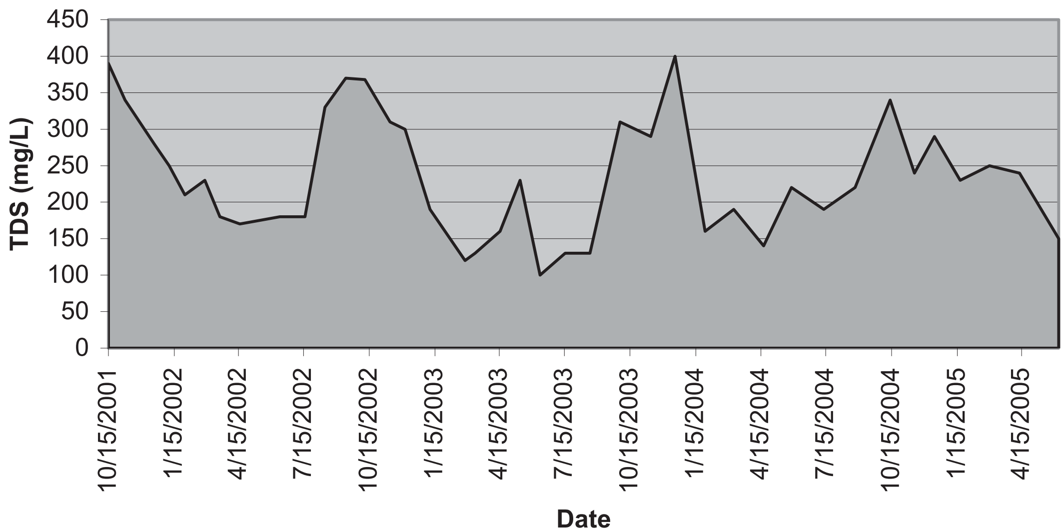

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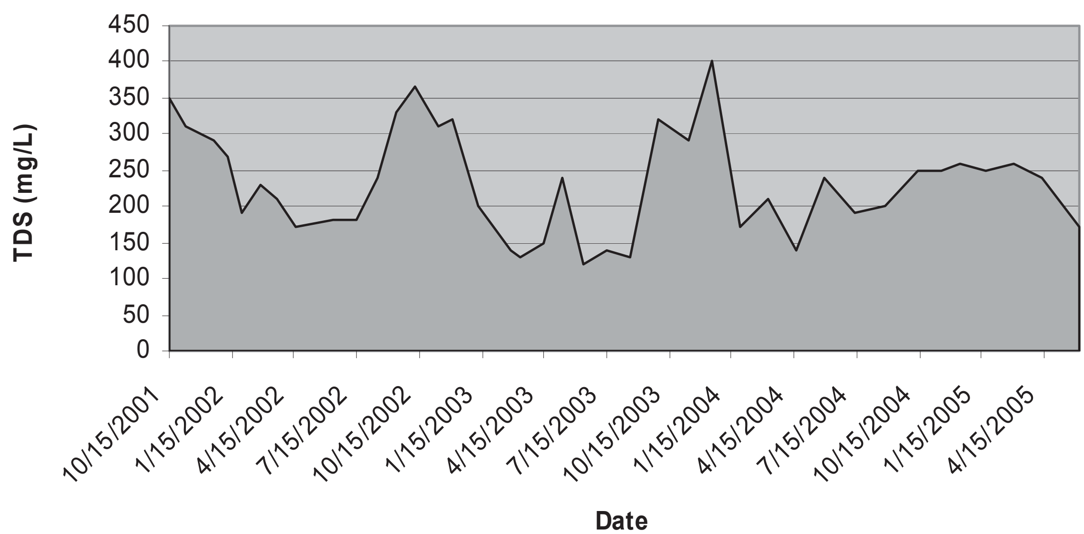
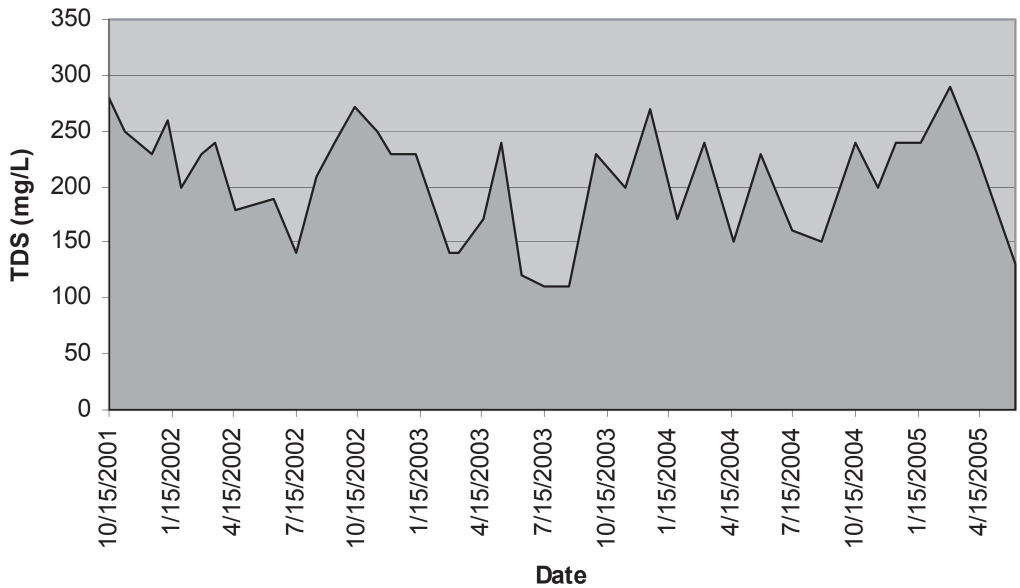
Figure 4.2-6
Regional Survey Grab Sample Data
Station #14 – Old River at CCWD Intake



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-7
Station #15 – Confluence of Old River and
Victoria Canal at Widows Island



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-8
Station #18 – Middle River at Highway 4 Bridge

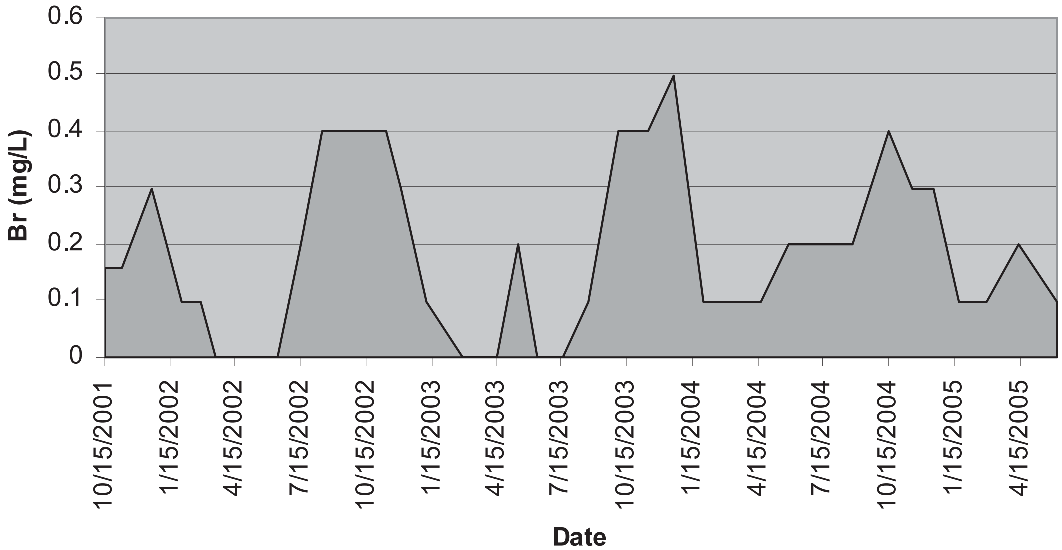
The primary source of bromide in the Delta is saltwater intrusion. Other sources include drainage returns in the San Joaquin River and the Delta, and connate water beneath some Delta islands. The bromide in river and agricultural irrigation sources primarily comes from seawater intrusion into applied water delivered from the Delta. As shown in Table 4.2-2, TDS, electrical conductivity, bromide, and Cl data indicate that seawater intrusion is highest in the western and southern portions of the Delta, where the direct effects of recirculated bromide from the San Joaquin River are evident (DWR, 2001).

Overall, bromide patterns in the Delta are similar to salinity patterns in the Delta (DWR, 2001). Like salinity, bromide concentrations are highest in the west and south Delta channels affected by the San Joaquin River (DWR, 2001). Like salinity, bromide concentrations are higher in dry years than in wet years, and bromide concentrations are higher during low Delta outflows as compared to medium or high flows (DWR, 2001).

Figure 4.2-9, **Figure 4.2-10**, and **Figure 4.2-11** illustrate the bromide concentrations at various locations in the Delta. As was seen in the charts for salinity, the bromide concentration shows an increase between August and December. The levels are much higher during these months than during the rest of the year. Bromide concentrations in Delta waters tend to be strongly correlated with Cl concentration.

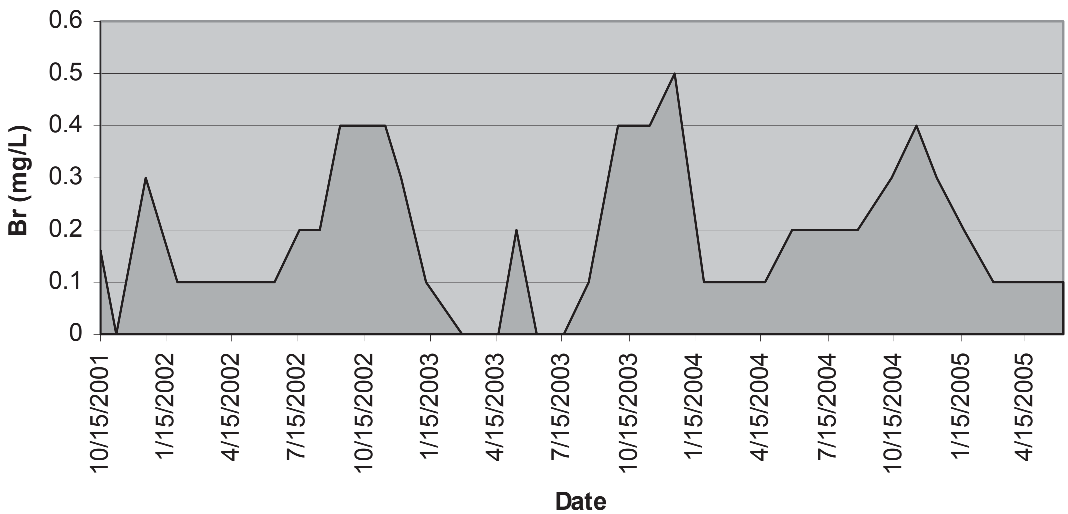
X2

Delta outflow, along with tidal action, is one of the primary factors controlling water quality in the Delta. While tidal action pushes saline water into and out of the Delta, Delta outflow provides an ongoing barrier against saline water intrusion. The standards governing X2 (the distance in kilometers from the Golden Gate of 2 parts per thousand (ppt) salinity within the Delta) are a



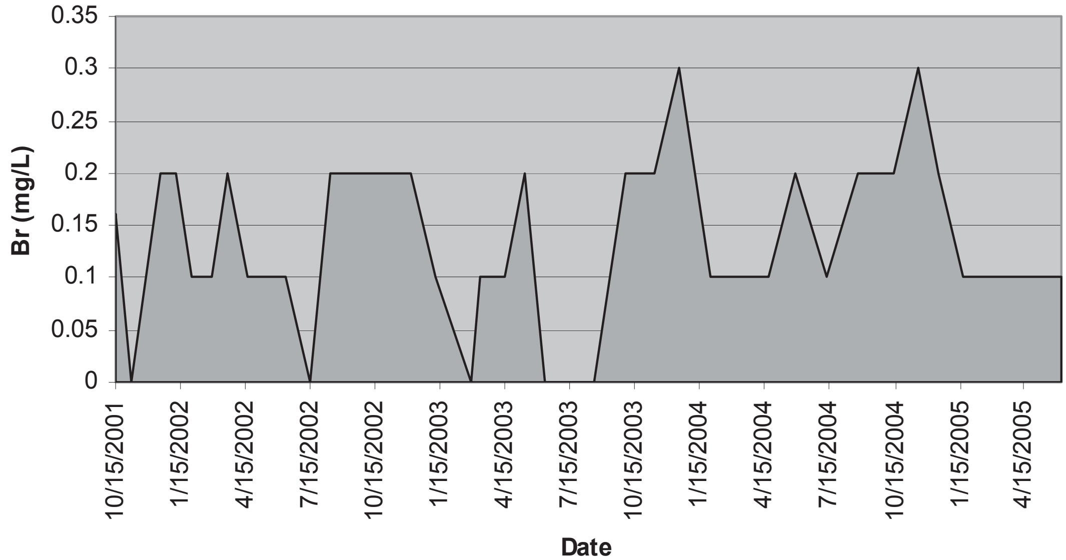
Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-9
Regional Survey Grab Sample Data -
Station #14 – Old River at CCWD Intake



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-10
Station #15 – Confluence of Old River and
Victoria Canal at Widows Island



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.2-11
Station #18 – Middle River at Highway 4 Bridge

tool used to regulate and manage salinity within the Delta and modeling results are available in Appendix C-4. When Delta outflow is low, seawater can intrude farther into the Delta, increasing the value of X2 and salinity / bromide concentrations at drinking water intakes. When Delta outflow is high, seawater is driven back towards San Francisco Bay, decreasing the values of X2 and salinity / bromide concentrations at drinking water intakes.

The position of X2 is managed through reservoir releases and, in some instances, curtailment of Delta pumping. The length of time that X2 must be positioned at set locations in the Delta each month is determined by a formula that considers the previous month's inflow to the Delta from the Sacramento and San Joaquin Rivers. The February through June period is regulated by the X2 standard, to provide protection to Delta fisheries.

X2 is currently used as a key indicator in managing Delta conditions. It is correlated with a variety of biological indicators and is related to the magnitude of fresh water flowing downstream through the Delta, and saltwater moving upstream within the lower portion of the Delta. The *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta* (Basin Plan) defines requirements for maintaining X2 at Port Chicago, Chipps Island, and Collinsville (SWRCB, 1995).

Organic Carbon

Like salinity and bromide concentrations, organic carbon concentrations in the Delta vary both geographically and seasonally. Like salinity and bromide, organic carbon concentrations are higher in the west and south Delta than in locations nearer to the Sacramento River (Table 4.2-2). However, unlike salinity and bromide, organic carbon concentrations are typically lower in the summer and higher during the wetter, winter months. Organic carbon is important because of its role in the formation of DBPs, specifically trihalomethanes. Only a portion of organic carbon is responsible for DBP formation. Studies conducted by the California Department of Water Resources (DWR, 2001) suggest that Delta island drainage contributes 38 to 52 percent of the DBP-forming carbon in the Delta during the winter, and 40 to 45 percent in the summer during the irrigation season.

The Sacramento and San Joaquin Rivers and drainage return flows from in-Delta islands are important sources of DOC and TOC to the Delta (CALFED, 2000). Of the organic carbon loading contributed by tributary inflow, the Sacramento River contributes an estimated 71 percent of the total carbon load to the Delta (DWR, 2001). The Sacramento River is a major contributor of organic carbon because about three-quarters of the total Delta inflow comes from the Sacramento River (DWR, 2001). The San Joaquin River contributes about 20 percent of the TOC load attributed to tributary inflow (DWR, 2001).

Sacramento and San Joaquin Rivers

As shown in Table 4.2-2, concentrations of many water quality constituents, including TDS, bromide, and organic carbon, are typically higher in Delta exports than in Sacramento River inflow. Water quality in the Sacramento River upstream of the Delta is generally good and acceptable for agricultural and municipal/industrial (M&I) uses although the Colusa Drain and a major wastewater discharge near Freeport degrade the Sacramento River water quality as it enters the Delta.

Salinity along the lower San Joaquin River, near its point of entry into the Delta, is relatively high in comparison to salinity in the Sacramento River. During the irrigation season, daily electrical conductivity (EC) values at Vernalis are generally less than 750 microSiemens per centimeter (μS/cm), and are usually less than 1,000 μS/cm during the remainder of the year. Salt concentrations in the San Joaquin River downstream of Vernalis increase because of agricultural activities discharges from the Stockton wastewater treatment plant.

4.2.2 Environmental Consequences

Analysis of Project Alternatives

Potential effects of the project alternatives on the Delta and upstream areas were assessed with the aid of computer models developed by DWR and Reclamation, as updated for this project by CCWD and the consultant team for the project. Water supply, water management, and water quality conditions were modeled and analyzed for a 2005 (existing) level of development and 2030 (future) level of development. The 2005 level of development reflects the level of water supply demand in 2005, patterns of land use in 2005, and the water-related facilities assumed to be in place under existing conditions. The 2030 level of development reflects the projected level of water supply demand in 2030, projected patterns of land use in 2030, and the additional water-related facilities assumed to be in place by 2030. Conditions without any of the project alternatives were modeled under both 2005 and 2030 levels of development. For the 2005 modeling, those conditions are labeled “Existing Condition.” For the 2030 modeling, those conditions are labeled “Future Without Project.”

Conditions with each of the project alternatives were also modeled under both 2005 and 2030 levels of development. This modeling methodology allows comparisons to be made between the Existing Condition and each of the project alternatives under the 2005 level of development, and between the Future Without Project and each of the project alternatives under the 2030 level of development. This is a standard modeling approach for water-related projects. The following discussion provides a description of the models used for this purpose. Additional detailed information on the models, model assumptions, and the modeling process can be found in Appendix C-3.

Hydrology, Water Operations, Hydrodynamics, and Water Quality Models

Potential effects of the project alternatives on Delta flows, Sacramento and San Joaquin River instream flows, SWP and CVP reservoir releases, and reservoir storage levels were evaluated using DWR/Reclamation's hydrology and water operations model, California Simulation Model II (CalSim II). Model output from the CalSim II analysis was then used as input to DWR's hydrodynamic/water quality model of the Delta (Delta Simulation Model, Version 2 [DSM2]). The CalSim II and DSM2 models represent the industry standard analytical tools for predicting changes in Delta conditions and CVP and SWP operations. A discussion of background information and key elements, assumptions, and limitations of CalSim II and DSM2 is provided below.

As discussed in Sections 3.1.2 and 3.4.1, operational restrictions imposed on the SWP and CVP to protect fishery resources are an important part of the background conditions in the Delta. However, considerable uncertainty exists regarding both what the regulations will be and how they will be implemented from year to year.

To capture the range of operations likely with fishery restrictions, both current and future, and the resulting SWP and CVP operations, two scenarios were simulated. The "moderate fishery restriction" scenario represents the least restrictive array of requirements that are reasonably to be expected under current and future regulatory conditions, while the "severe fishery restriction" scenario captures the most restrictive requirements reasonably to be expected.

Analyses using both the moderate and severe fishery restrictions assumptions were used to bracket the range of background conditions that are likely to occur in any year, and to evaluate the environmental effects of the project alternatives under this range of conditions. The assumptions used to estimate these restrictions are described in Appendix C-3.

Water supply and management model results are provided in Appendix C-4. Water quality and hydrodynamic model results are provided in Appendix C-5.

CalSim II: Key Elements and Background Information

CalSim II is considered the best available tool for modeling operations of the CVP and SWP and is the system-wide hydrologic and operations model used by Reclamation and DWR to conduct planning and impact analyses for the Sacramento River, San Joaquin River, and Delta. CalSim II is also the only peer-reviewed model available to analyze the impacts of the project on the water resources of the Delta and the upstream watershed. CalSim II was developed to determine the reliability of water deliveries to CVP and SWP contractors. The model is now regularly used for water resources studies in the Delta, including water-right studies prepared for the SWRCB and CEQA and NEPA documents to estimate potential changes in surface water resources.

Land use, water infrastructure, water supply contracts, and regulatory requirements are held constant over the period of simulation, representing a fixed level of water demands and operational parameters in CalSim II. DWR and Reclamation have developed land-use-based estimates of water demands associated with current and anticipated future land uses in the Central Valley.

The historical flow record from October 1921 to September 2003, adjusted for the influence of land use changes and upstream flow regulation, is used to represent the possible range of water supply conditions at a given level of development. This 82-year historical period provides a sufficient variety of hydrological conditions (e.g., droughts and wet-year periods of varying magnitude and length) to evaluate the potential consequences of a project that would change water operations in the Delta.

The analyses performed for this project are based on CalSim II studies for 2005 and 2030 levels of development prepared as part of the Common Assumptions effort for the ongoing CALFED surface storage projects.[1] The Common Assumptions 2030 level of development scenarios include future water supply facilities and operations that are considered reasonably likely to be implemented, as described in Section 4.1.2.

A review of the methodology, software, and application of CalSim II was conducted in 2003 (Close et al., 2003). The main limitations of CalSim II that are relevant to its application for this EIS/EIR are as follows:

Monthly time step. Since CalSim II uses a monthly time step, it does not represent daily variations that may occur in the rivers under actual flow and weather conditions. The hydrodynamic and water quality modeling conducted using DSM2 uses a 15-minute time step, but uses the CalSim II average monthly inflows to the Delta as boundary conditions. Water quality results from DSM2 are averaged over a month to provide input salinity to CalSim II that drives simulated Los Vaqueros Reservoir operations. Changes in salinity on a monthly time step can be substantial and may not accurately capture operational decisions that change over the time scale of days or weeks. This is a recognized limitation of the model, and is addressed through careful interpretation of model results that include large changes between subsequent months.

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1 Common Assumptions has not yet developed a standard constraint equation for Old and Middle River Flows under either the Wanger Ruling or the 2008 OCAP. Currently, more than one equation is being evaluated by the Common Assumptions effort. To evaluate moderate and severe Delta fishery restrictions in CalSim II, a method first implemented by the Bay-Delta Conservation Plan modeling team was used which averages three equations to determine net flows in Old and Middle rivers (See Appendices C-2 and C-3). Each equation includes pumping at the SWP Banks and CVP Jones pumping facilities, and the portion of pumping at Los Vaqueros intakes that had been shifted from SWP and CVP facilities for the South Bay water agencies (Alternative 1 and Alternative 2). The portion of pumping at the Los Vaqueros intakes to meet CCWD demand and other project benefits (including Delta Supply Restoration in Alternative 1 and Dedicated Storage for Environmental Water in Alternative 2), either through direct diversion or diversion to storage, is not included in the equations used in the CalSim II model to constrain modeled net flow in Old and Middle rivers. The impact analysis performed using the DSM2 Delta hydrodynamics model calculates flows in Old and Middle rivers based upon all simulated boundary flows and diversions, including all diversions at the Los Vaqueros intakes (See Section 4.3.2, Subsection titled, Old and Middle Rivers, page 4.3-87).

Threshold Sensitivity in CalSim II. CalSim II simulates operational rules to guide reservoir and pumping operations and decisions. Some of these rules specify threshold values that, when exceeded, trigger a different operation. This can result in simulated operations with changes greater than might be expected in practice, because in practice operator judgment plays a role in interpreting and implementing operational rules.

Similarly, some regulatory requirements specify thresholds that trigger different standards, which cannot be simulated with accuracy in a monthly time-step model. For example, the X2 requirement at Port Chicago applies only in months when the average EC at Port Chicago during the 14 days just before the first day of the month is less than or equal to 2.64 millimhos per centimeter (mmhos/cm).

Use of these threshold values in CalSim II, coupled with a monthly time step, can result in responses to small changes that might be larger than expected in practice for any given month, but generally average out over several months. Changes in simulated CVP and SWP operations between an Existing or Future Without Project scenario and a project alternative are carefully investigated to determine whether such changes would reasonably be caused by the project alternative or are an artifact of the approximations used in the model.

CalSim II is recognized as a valuable tool when used in a comparative analysis, such as for this EIS/EIR. Results from a single simulation may not necessarily correspond to actual system operations for a specific month or year, but are representative of general water supply conditions. Model results are best interpreted using various statistical measures such as long-term and year-type average, and probability of exceedance. In this form, the model results adequately estimate the potential impacts of the project alternatives, notwithstanding the limitations of CalSim II previously discussed.

DSM2: Key Elements and Background Information

DSM2 is a one-dimensional numerical model developed by DWR for simulation of tidal hydraulics, water quality, and particle tracking in the Delta. This model is the standard tool used by DWR and Reclamation for analyzing potential impacts of the project alternatives on water conditions in the Delta. The DSM2 model was used in conjunction with CalSim II to evaluate the potential impacts of the project alternatives on Delta channel flow, water level, and water quality. Appendix C-3 provides the input assumptions and other criteria used for the DSM2 modeling analysis. A brief summary is provided below.

The DSM2 analysis used monthly simulated boundary flows from the CalSim II analysis described above. Changes in simulated Delta tidal flows, stage, and water quality, in comparison to Existing and Future Without Project conditions, were determined for the 16-year period from 1976 to 1991. This period includes the 2-year drought from 1976 to 1977, as well as the 6-year drought, from 1987 to 1992. This shorter period of simulation, rather than the 82 year CalSim II analysis period, has been standard practice for DSM2 modeling studies.

A recognized issue in using CalSim II inputs to DSM2 is that the estimation of Delta water quality is approached differently by the two models. This sometimes leads to a condition in which the

CalSim II model estimates the amount of outflow required to avoid causing a Delta water quality violation, but the subsequent DSM2 estimate of Delta salinity shows that the standard might be exceeded. This mismatch between the models is generally small, but still occurs. Due to this known mismatch, interpretation of DSM2 results that are based on CalSim II inputs for analysis of compliance with Delta water quality standard compliance is best done in a comparative fashion between two model studies.

Most water quality impacts were analyzed using DSM2 outputs for electrical conductivity, either directly or as converted to Cl concentrations. Changes in X2 location were assessed from the CalSim II output.

Operations and Benefits Provided by Project Alternatives

To perform the analysis of the Los Vaqueros Reservoir Expansion Project, the CalSim II model described was modified to include Los Vaqueros Reservoir, the existing intakes, and the new Delta intake and pump station. This allowed estimation of Los Vaqueros Reservoir operations in conjunction with the state and federal water facilities represented within the CalSim II model. Details on the inclusion of Los Vaqueros Reservoir operations within the CalSim II model are presented in Appendix C.

As described in Chapter 3, the alternatives were designed to provide various levels of water supplies for environmental water management and water supply reliability, while improving delivered drinking water quality. The project alternatives were modeled using the tools described previously in this section to determine the benefits they would provide and to assess the impacts of providing those benefits. The physical and operational characteristics of each alternative are described in detail in Chapter 3.

Table 4.2-3 presents the annual average of the total diversions that would be taken at Rock Slough, Old River, AIP, and, under Alternatives 1 and 2, the new Delta intake facilities. These diversions would be either directly delivered or stored. Diversions to storage would be later released (e.g. releases to South Bay water agencies or wildlife refuges). These releases are not included in Table 4.2-3 but are discussed as part of the project benefits. The diversions are grouped by the initial destination of the water that is pumped. For a further breakdown of the water use (for instance, by CCWD water right, month, and water year type), see Appendix C-4.

As shown in Table 4.2-3, direct deliveries to CCWD under each of the project alternatives would decrease during droughts compared to the Existing and Future Without Project conditions, because of the use of CCWD's share of the increased storage capacity in Los Vaqueros Reservoir. Direct deliveries to CCWD under Alternative 3 would decrease during all conditions because the reservoir is operated to provide additional environmental water management benefits as described in Chapter 3. Annual average diversions to storage would be greater for all alternatives compared to the Existing and Future Without Project conditions because the larger reservoir provides more available storage space. The additional stored water would then be available for release to project participants, providing environmental water management, water supply reliability, and water quality benefits as described in the following subsections.

TABLE 4.2-3
ANNUAL AVERAGE DELTA DIVERSIONS AT ROCK SLOUGH, OLD RIVER, VICTORIA CANAL, AND NEW DELTA INTAKE FACILITIES, BY WATER USE (TAF/YR)

	Long-Term Average			1987-1992 Drought Average			1976-1977 Drought Average		
	Direct Delivery to CCWD	Direct Delivery to Others	Diversion to LV Storage	Direct Delivery to CCWD	Direct Delivery to Others	Diversion to LV Storage	Direct Delivery to CCWD	Direct Delivery to Others	Diversion to LV Storage
MODERATE FISHERIES RESTRICTIONS									
2005 Level of Development									
Existing Condition	100	0	28	112	0	24	111	0	0
Alternative 1	99	204	65	104	118	72	90	168	0
Alternative 2	99	212	76	107	128	77	94	191	0
Alternative 3	83	0	48	65	0	57	28	0	0
Alternative 4	97	0	32	103	0	23	82	0	0
2030 Level of Development									
Future Without Project	135	0	31	151	0	22	150	0	1
Alternative 1	132	189	75	138	109	79	122	157	4
Alternative 2	132	200	83	141	125	83	127	170	4
Alternative 3	109	0	61	100	0	58	64	0	2
Alternative 4	131	0	36	141	0	23	119	0	2
SEVERE FISHERIES RESTRICTIONS									
2005 Level of Development									
Existing Condition	100	0	27	116	0	17	111	0	0
Alternative 1	99	197	66	116	130	33	93	159	0
Alternative 2	100	207	73	115	143	33	96	176	0
Alternative 3	84	0	46	81	0	25	28	0	0
Alternative 4	96	0	32	107	0	17	82	0	0
2030 Level of Development									
Future Without Project	137	0	29	160	0	13	150	0	1
Alternative 1	134	184	74	157	137	23	123	154	4
Alternative 2	135	194	80	159	148	23	132	166	4
Alternative 3	112	0	57	117	0	28	64	0	2
Alternative 4	132	0	34	152	0	12	120	0	1

CCWD = Contra Costa Water District
LV = Los Vaqueros
TAF = thousand acre-foot (feet)
YR = year

Project Benefits Analysis

The evaluation of benefits described in this report is intended to provide information for potential project participants and to provide a basis for evaluating potential environmental impacts. All of the project alternatives share two primary objectives: to use an expanded Los Vaqueros Reservoir to develop water supplies for environmental water management, and to increase water supply reliability for Bay Area water providers. The facilities considered and the manner in which the alternatives are operated determine to what extent the primary objectives are achieved. All of the project alternatives also share a secondary objective: to use an expanded Los Vaqueros Reservoir to improve the quality of water deliveries to municipal and industrial customers in the San Francisco

Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives. (See Chapter 1 for a discussion of project purpose and need and objectives.) The extent of the benefits achieved in each of these areas will depend on several factors, including future Delta conveyance and habitat improvements, Delta operations requirements, and the project's precise environmental water management actions as further developed in project permits and agreements with project partners.

Environmental Water Management

Benefits are determined by the facilities and operations for each project alternative. The modeling results show that improvements in environmental water management are similar for a given project alternative across levels of development and fishery restrictions. Appendix C-4 provides detailed model results for water supply and management.

The project alternatives result in varying degrees of improvement in environmental water management depending on the water system operations implemented. Under Alternative 1, most of the improvement in environmental water management would be provided through Improved Fish Screening (see Section 3.1.2 and 3.4.2). **Table 4.2-4** shows the amount of water that would be diverted through the Los Vaqueros Reservoir system positive-barrier fish screens and delivered to the South Bay water agencies to replace water that would otherwise have been diverted at the existing SWP and CVP export pumps. CVP and SWP Delta export pumping would be reduced to correspond with the use of the Los Vaqueros Reservoir pumping system for the South Bay water agencies. Shifting this water diversion to the more effectively screened Los Vaqueros Reservoir system intakes would have fewer impacts to fish than the same amount of water diverted from either the SWP or CVP export facilities.

As analyzed in this EIS/EIR, this export pumping reduction takes place at the same time as the shift to Los Vaqueros Reservoir system intakes, but DWR, Reclamation and the state and federal fisheries agencies could optimize the timing of the reduction to further benefit fish. For example, the SWP and CVP Delta export pumps could be operated at minimal levels in April to improve salmon migration or to allow delta smelt larvae to move out of the South Delta, or they could be operated at minimal levels in February to allow longfin smelt larvae to move out of the South Delta. Initial estimates indicate that such operation could yield about 100 to 150 TAF of water per year to use in this manner. In either case, using the Los Vaqueros Reservoir system to deliver water to South Bay water agencies would result in improvement in environmental water management. Alternative 1 would also provide improvement in environmental water management through the No-Diversion Period and Multiple Delta Intake Locations (see Section 3.1.2 and 3.4.2).

In Alternative 2, most of the improvement in environmental water management would be provided through Improved Fish Screening, as described above, and Dedicated Storage for Environmental Water (see Section 3.1.2 and 3.4.2). **Table 4.2-5** shows the amount of water that would be diverted through the Los Vaqueros Reservoir system positive-barrier fish screens and delivered to the South Bay water agencies, plus the amount of water that would be provided for environmental water supplies for Delta fishery protection, San Joaquin Valley refuges, instream flows or other environmental purposes. For purposes of modeling, this water is assumed to be transferred to

TABLE 4.2-4
ALTERNATIVE 1 SUMMARY OF BENEFITS

	Benefits											
	Moderate Fishery Restrictions						Severe Fishery Restrictions					
	2005 Level of Development			2030 Level of Development			2005 Level of Development			2030 Level of Development		
		6-Year Drought[1]			6-Year Drought			6-Year Drought			6-Year Drought	
Operations	Long-term Avg[2]	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total
Environmental Water Management[3]	220 TAF/yr	140 TAF/yr	840 TAF	205 TAF/yr	135 TAF/yr	820 TAF	205 TAF/yr	145 TAF/yr	865 TAF	190 TAF/yr	145 TAF/yr	870 TAF
South Bay Water Agencies Water Supply Reliability	20 TAF/yr	35 TAF/yr	200 TAF	20 TAF/yr	30 TAF/yr	170 TAF	30 TAF/yr	30 TAF/yr	180 TAF	30 TAF/yr	25 TAF/yr	160 TAF
CCWD Water Supply Reliability[4]	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF
Emergency Water Storage[5]	235 TAF	180 TAF	NA	225 TAF	170 TAF	NA	220 TAF	110 TAF	NA	210 TAF	95 TAF	NA
Additional Real-time Operating Benefits	Multiple intake locations to further avoid fish impacts; increased water supply reliability by reducing regulatory pumping restrictions Timing of pumping reductions at SWP/CVP Delta export facilities to further benefit fish											
South Bay Water Agencies Water Quality	Incidental taste & odor improvements, Incidental salinity improvements											
CCWD Water Quality	Incidental improvement in CCWD's ability to meet its delivered water quality goal											

1 6-year drought values based on hydrology of 1987-1992 drought
2 Long-term average values shown based on 82-year simulation
3 Environmental Water Management in Alternative 1 includes screened intakes, a 30-day No-Diversion period, multiple intake locations, and possible optimization of export reduction timing to benefit Delta fish
4 Assumes 20 TAF additional storage for CCWD
5 Average amount of water available in the reservoir for a single-year emergency

TABLE 4.2-5
ALTERNATIVE 2 SUMMARY OF BENEFITS

	Benefits											
	Moderate Fishery Restrictions						Severe Fishery Restrictions					
	2005 Level of Development			2030 Level of Development			2005 Level of Development			2030 Level of Development		
		6-Year Drought[1]			6-Year Drought			6-Year Drought			6-Year Drought	
Operations	Long-term Avg[2]	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total
Environmental Water Management[3]	260 TAF/yr	190 TAF/yr	1,150 TAF	245 TAF/yr	190 TAF/yr	1,140 TAF	250 TAF/yr	185 TAF/yr	1,120 TAF	240 TAF/yr	185 TAF/yr	1,110 TAF
CCWD Water Supply Reliability[4]	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF
Emergency Water Storage[5]	225 TAF	155 TAF	NA	215 TAF	145 TAF	NA	210 TAF	95 TAF	NA	200 TAF	90 TAF	NA
Additional Real-time Operating Benefits	Multiple intake locations to further avoid fish impacts; increased water supply reliability by reducing regulatory pumping restrictions Timing of pumping reductions at SWP/CVP Delta export facilities to further benefit fish											
South Bay Water Agencies Water Quality	Incidental taste & odor improvements, Incidental salinity improvements											
CCWD Water Quality	Incidental improvement in CCWD 's ability to meet its delivered water quality goal											

1 6-year drought values based on hydrology of 1987-1992 drought
2 Long-term average values shown based on 82-year simulation
3 Environmental Water Management in Alternative 2 includes screened intakes, a 30-day No-Diversion period, multiple intake locations, dedicated storage for environmental water, and possible optimization of export reduction timing to benefit Delta fish
4 Assumes 20 TAF additional storage for CCWD
5 Average amount of water available in the reservoir for a single-year emergency

San Luis Reservoir where it would be available for delivery to Central Valley wildlife refuges. Alternative 2 would also provide improvement in environmental water management through the No-Diversion Period and Multiple Delta Intake Locations (see Section 3.1.2 and 3.4.3).

In the case of Alternative 3, most of the improvement in environmental water management would be provided through both the No-Diversion Period and Dedicated Environmental Water Storage (see Section 3.1.2 and 3.4.2). Under this alternative, CCWD could temporarily stop pumping from the Delta and instead draw from the stored Los Vaqueros Reservoir supplies to serve its customers during periods that would allow Reclamation to retain cold water stored in upstream reservoirs. The water stored upstream of the Delta in CVP reservoirs that had been reserved for delivery to CCWD could be reallocated for environmental purposes. These purposes could include cold water releases to support salmon spawning or pulse flow releases to support salmon migration in addition to water for wildlife refuges or other environmental purposes. The CVP water supply foregone by CCWD in this manner could also be conveyed through the Delta by existing export facilities for environmental purposes south of the Delta. **Table 4.2-6** shows the amount by which CCWD would decrease its diversions, the amount stored upstream for environmental purposes, and the amount conveyed through the Delta for San Joaquin Valley Refuge use. Alternative 3 would also provide improvement in environmental water management through Multiple Delta Intake Locations (see Section 3.1.2 and 3.4.4).

The improvement in environmental water management under Alternative 4 would be smaller than under the other alternatives. Most of the benefit would be provided through the No-Diversion Period operations (see Section 3.1.2 and 3.4.2). When the reservoir is above emergency levels, the no-fill and no-diversion periods described in Section 3.4.5 would apply. During extended dry conditions, the existing reservoir can fall below emergency levels, which results in exemptions from the no-fill and no-diversion periods so that it can be refilled up to emergency levels. The additional storage constructed under Alternative 4 would increase the number of years in which CCWD would implement the no-fill and no-diversion periods. The quantity presented in **Table 4.2-7** represents the reduction in diversions required to maintain the expanded reservoir at or above emergency levels. Alternative 4 would also provide improvement in environmental water management through Multiple Delta Intake Locations (see Section 3.1.2 and 3.4.5).

Water Supply Reliability

Water supply reliability benefits are determined by the facilities and operations for each project. The modeling results show that these benefits are similar for a given project alternative across levels of development and fishery restrictions. Appendix C-4 provides detailed model results of water supply and management.

Under Alternative 1, the water supply reliability benefit would be provided through Delta supply restoration, dry-year storage, and increased emergency water storage (see Section 3.1.2). With Delta supply restoration, direct diversions, and stored water supplies would be used to partially restore delivery reductions to the South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the SWP and CVP Delta export pumps. Dry-year storage would increase the amount of water available in dry years to South Bay water

TABLE 4.2-6
ALTERNATIVE 3 SUMMARY OF BENEFITS

	Benefits											
	Moderate Fishery Restrictions						Severe Fishery Restrictions					
	2005 Level of Development			2030 Level of Development			2005 Level of Development			2030 Level of Development		
		6-Year Drought[1]			6-Year Drought			6-Year Drought			6-Year Drought	
Operations	Long-term Avg[2]	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total
Environmental Water Management[3]	15 TAF/yr	45 TAF/yr	275 TAF	20 TAF/yr	65 TAF/yr	385 TAF	10 TAF/yr	55 TAF/yr	340 TAF	10 TAF/yr	45 TAF/yr	275 TAF
CCWD Water Supply Reliability[4]	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF	NA	3 TAF/yr	20 TAF
Emergency Water Storage[5]	245 TAF	180 TAF	NA	235 TAF	130 TAF	NA	235 TAF	130 TAF	NA	220 TAF	105 TAF	NA
CCWD Water Quality	Incidental improvement in CCWD 's ability to meet its delivered water quality goal											

1 6-year drought values based on hydrology of 1987-1992 drought
2 Long-term average values shown based on 82-year simulation
3 Environmental Water Management in Alternative 3 includes screened intakes, a 30-day No-Diversion period, and dedicated storage for environmental water
4 Assumes 20 TAF additional storage for CCWD
5 Average amount of water available in the reservoir for a single-year emergency

TABLE 4.2-7
ALTERNATIVE 4 SUMMARY OF BENEFITS

	Benefits											
	Moderate Fishery Restrictions						Severe Fishery Restrictions					
	2005 Level of Development			2030 Level of Development			2005 Level of Development			2030 Level of Development		
		6-Year Drought[1]			6-Year Drought			6-Year Drought			6-Year Drought	
Operations	Long-term Avg[2]	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total	Long-term Avg	Annual Avg	Total
Environmental Water Management[3]	NA	3 TAF/yr	18 TAF	NA	2 TAF/yr	14 TAF	NA	3 TAF/yr	17 TAF	NA	2 TAF/yr	14 TAF
Water Supply Reliability[4]	NA	10 TAF/yr	60 TAF	NA	10 TAF/yr	60 TAF	NA	10 TAF/yr	60 TAF	NA	10TAF/yr	60 TAF
Emergency Water Storage[5]	130 TAF	90 TAF	NA	120 TAF	80 TAF	NA	120 TAF	75 TAF	NA	115 TAF	70 TAF	NA
CCWD Water Quality[6]	3%			5%			5%			5%		

1 6-year drought values based on hydrology of 1987-1992 drought
2 Long-term average values shown based on 82-year simulation
3 Environmental Water Management in Alternative 4 includes screened intakes and a 30-day No-Diversion period
4 Assumes 60 TAF additional storage for CCWD and any other participating Bay Area water agencies
5 Average amount of water available in the reservoir for a single-year emergency
6 Improvement in amount of time CCWD water quality goal met

agencies and CCWD, reducing the need to purchase supplemental dry year supplies, activate dry-year exchange programs, or institute drought management measures. For South Bay water agencies, the combination of Delta supply restoration and dry-year storage is measured by the quantity of water available to participating agencies above that which would be available in the absence of the project.

For CCWD, dry-year storage is measured by the additional amount of water that could be available to CCWD at the beginning of a multi-year drought above that which would be available in the absence of the project. Emergency storage is measured by the amount of water that would be available to the Bay Area during shortages caused by natural disasters or other emergencies. Table 4.2-4 presents the Delta supply restoration, dry-year storage, and emergency water storage for Alternative 1.

Under Alternatives 2, 3 and 4, the water supply reliability benefit would be provided through dry-year storage and increased emergency water storage (see Section 3.1.2). Dry-year storage in each of these alternatives would increase the amount of water available in dry years to CCWD. Emergency storage would increase the amount of water that would be available to the Bay region during shortages caused by natural disasters or other emergencies.

Table 4.2-7 presents the dry-year storage and emergency water storage under Alternatives 2, 3 and 4.

Water Quality Improvements

All alternatives would meet the secondary project objective of improving the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives. The water quality improvements would primarily benefit CCWD customers, as measured by the delivered salinity levels. For all of the alternatives, the expanded storage would provide additional dry year supply for CCWD, which would also provide an inherent water quality improvement for CCWD in dry years, when this type of benefit is most needed.

The long-term average improvement in delivered water quality for CCWD would be small in Alternatives 1, 2, and 3; these benefits have not been quantified. The benefit to CCWD delivered water quality would be relatively larger in Alternative 4, and is shown in Table 4.2-7. Alternatives 1 and 2 also are expected to result in minor improvements in the quality of water delivered to South Bay water agencies by providing low salinity water from the Los Vaqueros Reservoir to the South Bay water agencies during dry periods. This would reduce deliveries of Delta water to the South Bay water agencies through Clifton Court Forebay during such dry periods, where salinity would be relatively high, and where warm, shallow, slow-moving water often results in algae growth and a resulting increase in organic carbon content and taste and odor issues. These minor improvements are noted, but not quantified.

Methodology for Impact Assessment

The changes in Delta operations identified in the previous section have been analyzed to determine whether they would change water supplies for other water users, Delta water quality, or Delta water levels. An impact analysis was conducted to assess whether changes under each project alternative would cause a significant adverse impact. Impacts are classified as no impact, less than significant impact, less than significant with mitigation, significant and unavoidable, or beneficial.

The parameter values used to determine potential impacts have been obtained from the hydrologic modeling analysis described in the previous section.

The assessment relies on a comparative analysis of operational and resulting environmental conditions between Existing and Future Without Project conditions and each of the project alternatives. Such comparisons were performed for both the 2005 level of development and the 2030 level of development and for moderate and severe fishery restrictions (described in the previous section and Chapter 3). Water supply and management model results are provided in Appendix C-4. Water quality and hydrodynamic model results are provided in Appendix C-5.

Significance Criteria

The following thresholds for determining significance of the project impacts are based on the environmental checklist in Appendix G of the California Environmental Quality Act Guidelines, thresholds that have been developed by state and federal agencies for other Delta water projects, and the judgment of the lead agencies and the EIS/EIR preparers. The following thresholds also encompass factors taken into account under National Environmental Policy Act to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect on water supply, water quality, or water level if it would do any of the following:

- Result in substantial adverse effects on operations or decreases in water deliveries for water users including the SWP, CVP, and Delta agricultural diverters, or significant changes in carryover storage, or timing or rate of river flows
- Violate existing water quality standards
- Result in substantial water quality changes that would adversely affect beneficial uses
- Reduce surface water elevations in the Delta to a level that would not support existing land uses or planned land uses for which permits have been granted or to a level that would restrict water transfers at the SWP and/or CVP export facilities due to conflicts with in-Delta diversions

Impact Summary

Table 4.2-8 provides a summary of the impact analysis for issues related to water supply, water quality, and water levels based on actions outlined in Chapter 3.

TABLE 4.2-8
SUMMARY OF IMPACTS – WATER SUPPLY, WATER QUALITY, AND WATER LEVEL

	Project Alternatives			
Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.2.1: The project alternatives would not adversely alter deliveries of water to other users.	LS	LS	LS	LS
4.2.2: The project alternatives would not result in significant adverse changes in Delta water quality causing the violation of a water quality standard.	LS	LS	LS	LS
4.2.3: The project alternatives would not result in changes to Delta water quality that would result in significant adverse effects on beneficial uses.	LS	LS	LS	LS
4.2.4: Diversions of Delta water under the project alternatives would not result in a significant reduction of Delta water levels.	LS	LS	LS	LS
4.2.5: The project alternatives would not result in a cumulatively considerable contribution to significant adverse cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels.	LS	LS	LS	LS

NOTES:
SU = Significant Unavoidable Impact
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/ No Action Alternative, no new facilities would be constructed, and CCWD would continue operating the existing Los Vaqueros Reservoir and other facilities to deliver the highest quality water available subject to regulatory and physical constraints. This alternative would not change operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water supply, water quality, or water levels for other Delta water users, and would not considerably contribute to any adverse cumulative water resource effects.

Delta water supply reliability for the South Bay water agencies is currently limited by recent actions taken in the Delta to protect fish. This condition would continue in the Existing and Future Without Project Conditions. Water supply reliability for CCWD and other Bay Area water agencies would not be improved and additional emergency storage for CCWD and other Bay Area water agencies would not be increased. No additional supplies for improved environmental water management would be provided, and no additional water would be diverted through positive-barrier fish screens.

Impact 4.2.1: The project alternatives would not adversely alter deliveries of water to other users. (Less Than Significant Impact)

Each of the alternatives would alter the quantity, location, and timing of water diversions from the Delta to varying degrees. The following analysis addresses the potential for these changes to affect deliveries of water to other users. The effects of the alternatives on water deliveries to CVP and SWP customers may be evaluated directly by comparing the model estimates of these deliveries in the Existing and Future Without Project conditions to the corresponding estimates under each of the project alternatives. Other parameters, including reservoir carry-over storage and river flows into the Delta, are used to support the evaluation of effects on CVP and SWP water users, and also to evaluate potential effects on other water users, including other in-Delta diverters.

Effects on Delta water deliveries were analyzed by assessing changes in CVP and SWP exports from the Delta, changes in carry-over storage in CVP and SWP reservoirs, changes in Sacramento and San Joaquin River flows into the Delta, and changes in net Delta outflow. **Table 4.2-9** shows long-term averages of the parameters used to evaluate the effects of each of the project alternatives. Additionally, the changes were analyzed by the five water year types used in hydrologic planning in California, based on Sacramento Valley hydrology: wet, above normal, below normal, dry, and critical. This analysis by water year type assessed whether changes caused by the project alternatives were more pronounced during certain hydrologic conditions. The results of each of these analyses are discussed in the following paragraphs. See Appendix C-4 and Appendix C-4 for additional presentation of modeled deliveries, storage, and Delta flows.

Annual CVP and SWP Deliveries

The CVP pumps water from the Delta for delivery to customers in the Bay Area and San Joaquin Valley. The SWP also pumps water from the Delta, for delivery to customers in the Bay Area, San Joaquin Valley, central coast, and southern California. By design, the project alternatives should not affect these deliveries. In Alternatives 1 and 2, SWP deliveries to the South Bay water agencies are made through the Los Vaqueros Reservoir system facilities. In all alternatives, increased filling of Los Vaqueros Reservoir occurs primarily during surplus conditions when there is good water quality in the South Delta.

2005 Level of Development. CVP and SWP deliveries under each project alternative are compared to the Existing Condition. Typically deliveries increased slightly under the 2005 level of development. CVP and SWP deliveries do not change appreciably under any of the alternatives or fishery restrictions.

Table 4.2-9 presents the long-term average for CVP and SWP exports from the Delta. The long-term average shows that CVP exports increase slightly or remain the same for all project alternatives and both fishery restrictions compared to the Existing Condition. SWP exports vary slightly more but decrease no more than 0.1 percent for all project alternatives and both levels of fishery restriction. **Table 4.2-10** presents the wet year averages.

TABLE 4.2-9
SUMMARY OF CHANGES USED TO EVALUATE WATER DELIVERY TO OTHER USERS (all years)

		Annual CVP Exports[1,3] [TAF]	Annual SWP Exports[2,3] [TAF]	CVP and SWP Carry-over Storage[4] [TAF]	Sacramento River Flow at Hood [TAF]	San Joaquin River Flow at Vernalis [TAF]	Net Delta Outflow [TAF]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		2,287	2,781	7,355	16,189	3,207	15,862
Percent Change from Existing Condition	Alt. 1	0.0%	0.2%	0.0%	0.0%	0.0%	-0.2%
	Alt. 2	0.0%	0.2%	-0.2%	0.0%	0.0%	-0.4%
	Alt. 3	0.2%	0.8%	0.1%	0.0%	0.0%	-0.2%
	Alt. 4	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Existing Condition		2,151	2,626	7,409	16,177	3,206	16,149
Percent Change from Existing Condition	Alt. 1	0.1%	0.0%	-0.1%	0.0%	0.0%	-0.2%
	Alt. 2	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.3%
	Alt. 3	0.2%	0.7%	0.0%	0.0%	0.0%	-0.2%
	Alt. 4	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		2,299	2,806	7,086	16,149	3,177	15,700
Percent Change from Future Without Project	Alt. 1	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.1%
	Alt. 2	0.0%	-0.1%	-0.3%	0.0%	0.0%	-0.3%
	Alt. 3	0.2%	1.0%	0.0%	0.0%	0.0%	-0.2%
	Alt. 4	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Future Without Project		2,158	2,573	7,314	16,110	3,176	16,076
Percent Change from Future Without Project	Alt. 1	0.1%	-0.2%	-0.2%	0.0%	0.0%	-0.2%
	Alt. 2	0.1%	-0.1%	-0.3%	0.0%	0.0%	-0.3%
	Alt. 3	0.3%	0.9%	0.1%	0.0%	0.0%	-0.2%
	Alt. 4	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%

1 CVP exports include agricultural, refuge, municipal, and industrial deliveries.
2 Table A, Article 56 and Article 21 components of SWP exports are shown.
3 CVP and SWP exports include water pumped at Jones and Banks pumping plants and water delivered to the South Bay water agencies in lieu of Jones and Banks pumping. Delta supply restoration deliveries to South Bay water agencies in Alternative 1 are not included.
4 CVP and SWP carry-over storage includes end of September storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs.

% = percent

Alt. = alternative
CVP = Central Valley Project
SWP = State Water Project
TAF = thousand acre-feet

TABLE 4.2-10
WET YEAR ANNUAL AVERAGES OF CHANGES USED TO EVALUATE WATER DELIVERY TO OTHER USERS

		Annual CVP Exports[1,3] [TAF]	Annual SWP Exports[2,3] [TAF]	CVP and SWP Carry-over Storage[4] [TAF]	Sacramento River Flow at Hood [TAF]	San Joaquin River Flow at Vernalis [TAF]	Net Delta Outflow [TAF]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		2,605	3,570	9,687	23,894	5,658	28,877
Percent Change from Existing Condition	Alt. 1	0.3%	0.1%	0.0%	0.0%	0.0%	-0.1%
	Alt. 2	0.3%	0.2%	0.0%	0.0%	0.0%	-0.2%
	Alt. 3	0.2%	0.5%	0.1%	0.0%	0.0%	-0.1%
	Alt. 4	0.0%	0.1%	-0.1%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Existing Condition		2,495	3,385	9,692	23,892	5,658	29,205
Percent Change from Existing Condition	Alt. 1	0.1%	0.0%	0.0%	0.0%	0.0%	-0.2%
	Alt. 2	0.1%	0.0%	0.0%	-0.1%	0.0%	-0.3%
	Alt. 3	0.0%	0.5%	0.0%	0.0%	0.0%	-0.1%
	Alt. 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		2,630	3,658	9,461	23,829	5,643	28,566
Percent Change from Future Without Project	Alt. 1	0.1%	-0.4%	-0.1%	0.0%	0.0%	-0.1%
	Alt. 2	0.2%	-0.4%	-0.1%	-0.1%	0.0%	-0.2%
	Alt. 3	0.3%	1.1%	0.2%	0.0%	0.0%	-0.3%
	Alt. 4	0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Future Without Project		2,516	3,421	9,573	23,828	5,643	29,000
Percent Change from Future Without Project	Alt. 1	0.3%	0.0%	-0.1%	0.0%	0.0%	-0.2%
	Alt. 2	0.1%	0.0%	-0.1%	0.0%	0.0%	-0.2%
	Alt. 3	-0.1%	0.8%	0.1%	0.1%	0.0%	-0.1%
	Alt. 4	-0.1%	-0.1%	-0.1%	0.0%	0.0%	0.0%

1 CVP exports include agricultural, refuge, municipal, and industrial deliveries.
2 Table A, Article 56 and Article 21 components of SWP exports are shown.
3 CVP and SWP exports include water pumped at Jones and Banks pumping plants and water delivered to the South Bay water agencies in lieu of Jones and Banks pumping. Delta supply restoration deliveries to South Bay water agencies in Alternative 1 are not included.
4 CVP and SWP carry-over storage includes end of September storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs.

Alt. = alternative
CVP = Central Valley Project
SWP = State Water Project
TAF = thousand acre-feet

Table 4.2-11 presents the above normal year averages. **Table 4.2-12** presents the below normal averages. **Table 4.2-13** presents the dry year averages.

TABLE 4.2-11
ABOVE NORMAL YEAR ANNUAL AVERAGES OF CHANGES USED TO EVALUATE WATER DELIVERY TO OTHER USERS

		Annual CVP Exports[1,3] [TAF]	Annual SWP Exports[2,3] [TAF]	CVP and SWP Carry-over Storage[4] [TAF]	Sacramento River Flow at Hood [TAF]	San Joaquin River Flow at Vernalis [TAF]	Net Delta Outflow [TAF]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		2,388	2,958	8,255	18,357	3,015	17,296
Percent Change from Existing Condition	Alt. 1	0.1%	0.5%	-0.1%	0.1%	0.0%	-0.1%
	Alt. 2	0.0%	0.3%	-0.2%	0.0%	0.0%	-0.3%
	Alt. 3	-0.1%	0.7%	0.2%	0.1%	0.0%	-0.1%
	Alt. 4	-0.1%	0.4%	0.0%	0.1%	0.0%	0.0%
Severe Fishery Restrictions							
Existing Condition		2,238	2,766	8,350	18,355	3,015	17,608
Percent Change from Existing Condition	Alt. 1	0.1%	-0.1%	-0.1%	0.1%	0.0%	-0.1%
	Alt. 2	0.0%	-0.2%	-0.1%	0.1%	0.0%	-0.3%
	Alt. 3	-0.1%	0.1%	0.0%	0.0%	0.0%	-0.1%
	Alt. 4	0.2%	0.0%	0.0%	0.0%	0.0%	-0.1%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		2,418	2,934	7,994	18,247	2,977	17,069
Percent Change from Future Without Project	Alt. 1	0.0%	-0.1%	-0.2%	0.1%	0.0%	-0.1%
	Alt. 2	0.1%	0.0%	-0.3%	0.1%	0.0%	-0.3%
	Alt. 3	-0.2%	0.7%	-0.2%	0.0%	0.0%	0.0%
	Alt. 4	-0.2%	-0.2%	-0.1%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Future Without Project		2,269	2,641	8,307	18,192	2,977	17,524
Percent Change from Future Without Project	Alt. 1	0.2%	-0.3%	-0.1%	0.0%	0.0%	-0.3%
	Alt. 2	0.1%	-0.2%	-0.3%	-0.1%	0.0%	-0.6%
	Alt. 3	0.0%	0.5%	0.0%	-0.1%	0.0%	-0.3%
	Alt. 4	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%

1 CVP exports include agricultural, refuge, municipal and industrial deliveries.
2 Table A, Article 56 and Article 21 components of SWP exports are shown.
3 CVP and SWP exports include water pumped at Jones and Banks pumping plants and water delivered to the South Bay water agencies in lieu of Jones and Banks pumping. Delta supply restoration deliveries to South Bay water agencies in Alternative 1 are not included.
4 CVP and SWP carry-over storage includes end of September storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs.

Alt. = alternative
CVP = Central Valley Project
SWP = State Water Project
TAF = thousand acre-feet

TABLE 4.2-12
BELOW NORMALYEAR ANNUAL AVERAGES OF CHANGES USED TO EVALUATE WATER DELIVERY TO OTHER USERS

		Annual CVP Exports[1,3] [TAF]	Annual SWP Exports[2,3] [TAF]	CVP and SWP Carry-over Storage[4] [TAF]	Sacramento River Flow at Hood [TAF]	San Joaquin River Flow at Vernalis [TAF]	Net Delta Outflow [TAF]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		2,317	2,713	7,214	13,408	2,497	10,500
Percent Change from Existing Condition	Alt. 1	-0.8%	0.1%	-0.2%	-0.1%	0.0%	-0.3%
	Alt. 2	-0.8%	0.0%	-0.4%	-0.2%	0.0%	-0.6%
	Alt. 3	-0.4%	0.7%	-0.1%	0.1%	0.0%	-0.1%
	Alt. 4	-0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Existing Condition		2,136	2,575	7,229	13,453	2,496	10,858
Percent Change from Existing Condition	Alt. 1	0.1%	0.0%	-0.2%	0.0%	0.0%	-0.3%
	Alt. 2	-0.3%	-0.3%	-0.5%	0.1%	0.0%	-0.4%
	Alt. 3	0.1%	1.0%	0.0%	0.0%	0.0%	-0.3%
	Alt. 4	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		2,332	2,716	6,912	13,342	2,475	10,365
Percent Change from Future Without Project	Alt. 1	-0.5%	-0.2%	-0.2%	-0.1%	0.0%	-0.3%
	Alt. 2	-0.7%	-0.2%	-0.3%	-0.1%	0.0%	-0.5%
	Alt. 3	-0.4%	0.5%	-0.1%	-0.1%	0.0%	-0.3%
	Alt. 4	-0.9%	-0.2%	0.0%	-0.1%	0.0%	0.1%
Severe Fishery Restrictions							
Future Without Project		2,128	2,400	7,224	13,278	2,474	10,830
Percent Change from Future Without Project	Alt. 1	-0.3%	-0.8%	-0.1%	0.0%	0.0%	-0.1%
	Alt. 2	0.1%	-0.3%	-0.3%	0.0%	0.0%	-0.5%
	Alt. 3	0.5%	1.4%	0.2%	0.0%	0.0%	-0.6%
	Alt. 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

1 CVP exports include agricultural, refuge, municipal, and industrial deliveries.
2 Table A, Article 56 and Article 21 components of SWP exports are shown.
3 CVP and SWP exports include water pumped at Jones and Banks pumping plants and water delivered to the South Bay water agencies in lieu of Jones and Banks pumping. Delta supply restoration deliveries to South Bay water agencies in Alternative 1 are not included.
4 CVP and SWP carry-over storage includes end of September storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs.

Alt. = alternative
CVP = Central Valley Project
SWP = State Water Project
TAF = thousand acre-feet

TABLE 4.2-13
DRY YEAR ANNUAL AVERAGES OF CHANGES USED TO EVALUATE WATER DELIVERY TO OTHER USERS

		Annual CVP Exports[1,3] [TAF]	Annual SWP Exports[2,3] [TAF]	CVP and SWP Carry-over Storage[4] [TAF]	Sacramento River Flow at Hood [TAF]	San Joaquin River Flow at Vernalis [TAF]	Net Delta Outflow [TAF]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		2,174	2,358	5,879	11,207	1,660	7,560
Percent Change from Existing Condition	Alt. 1	0.0%	0.4%	-0.1%	0.0%	0.0%	-0.6%
	Alt. 2	0.2%	0.4%	-0.3%	0.1%	0.0%	-0.8%
	Alt. 3	0.7%	0.9%	0.0%	0.1%	0.0%	-0.4%
	Alt. 4	0.3%	0.5%	0.1%	0.0%	0.0%	-0.2%
Severe Fishery Restrictions							
Existing Condition		1,978	2,259	5,952	11,199	1,658	7,854
Percent Change from Existing Condition	Alt. 1	-0.2%	-0.2%	-0.3%	0.0%	0.0%	-0.4%
	Alt. 2	-0.2%	-0.2%	-0.4%	0.1%	0.0%	-0.5%
	Alt. 3	0.7%	0.7%	-0.4%	0.1%	0.0%	-0.3%
	Alt. 4	0.3%	0.3%	0.0%	0.0%	0.0%	-0.1%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		2,185	2,336	5,533	11,213	1,617	7,533
Percent Change from Future Without Project	Alt. 1	0.1%	-0.1%	-0.2%	0.1%	0.0%	-0.4%
	Alt. 2	-0.1%	0.0%	-0.3%	0.1%	0.0%	-0.5%
	Alt. 3	0.7%	0.8%	-0.2%	0.1%	0.0%	-0.2%
	Alt. 4	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Future Without Project		1,998	2,144	5,862	11,148	1,615	7,857
Percent Change from Future Without Project	Alt. 1	0.1%	-0.1%	-0.6%	0.1%	0.0%	-0.3%
	Alt. 2	-0.1%	-0.2%	-0.6%	0.1%	0.0%	-0.4%
	Alt. 3	0.5%	0.4%	-0.2%	0.1%	0.0%	0.0%
	Alt. 4	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.1%

1 CVP exports include agricultural, refuge, municipal and industrial deliveries.
2 Table A, Article 56 and Article 21 components of SWP exports are shown.
3 CVP and SWP exports include water pumped at Jones and Banks pumping plants and water delivered to the South Bay water agencies in lieu of Jones and Banks pumping. Delta supply restoration deliveries to South Bay water agencies in Alternative 1 are not included.
4 CVP and SWP carry-over storage includes end of September storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs.

Alt. = alternative
CVP = Central Valley Project
SWP = State Water Project
TAF = thousand acre-feet

Table 4.2-14 presents the critical year averages. During critical years CVP and SWP exports increase compared to the Existing Condition. Decreases in CVP and SWP deliveries were less than 1 percent from the Existing Condition in all water year types and would not be expected to result in a significant effect on deliveries.

TABLE 4.2-14
CRITICAL YEAR ANNUAL AVERAGES OF CHANGES USED TO EVALUATE WATER DELIVERY TO OTHER USERS

		Annual CVP Exports[1,3] [TAF]	Annual SWP Exports[2,3] [TAF]	CVP and SWP Carry-over Storage[4] [TAF]	Sacramento River Flow at Hood [TAF]	San Joaquin River Flow at Vernalis [TAF]	Net Delta Outflow [TAF]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		1,627	1,605	3,782	8,042	1,237	4,939
Percent Change from Existing Condition	Alt. 1	0.3%	0.5%	0.4%	-0.3%	0.0%	-0.5%
	Alt. 2	0.3%	0.5%	-0.9%	0.0%	0.0%	-0.3%
	Alt. 3	0.7%	2.6%	0.4%	-0.7%	0.0%	-1.6%
	Alt. 4	0.1%	-0.3%	0.5%	-0.3%	0.0%	-0.1%
Severe Fishery Restrictions							
Existing Condition		1,598	1,449	3,918	7,928	1,236	5,015
Percent Change from Existing Condition	Alt. 1	0.3%	0.6%	0.1%	-0.1%	0.0%	-0.2%
	Alt. 2	0.3%	0.2%	-0.1%	-0.1%	0.0%	-0.3%
	Alt. 3	0.5%	1.9%	0.3%	-0.2%	0.0%	-0.3%
	Alt. 4	0.2%	0.6%	0.1%	0.1%	0.0%	0.1%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		1,598	1,640	3,565	8,087	1,193	4,933
Percent Change from Future Without Project	Alt. 1	0.4%	0.9%	-0.4%	0.1%	0.0%	0.0%
	Alt. 2	0.2%	0.6%	-1.0%	0.3%	0.0%	0.0%
	Alt. 3	0.8%	3.3%	-0.4%	-0.2%	0.0%	-0.9%
	Alt. 4	-0.1%	0.0%	0.1%	0.0%	0.0%	0.3%
Severe Fishery Restrictions							
Future Without Project		1,548	1,509	3,708	8,049	1,193	5,078
Percent Change from Future Without Project	Alt. 1	0.3%	0.3%	-0.5%	-0.1%	0.0%	-0.2%
	Alt. 2	0.3%	0.2%	-0.8%	-0.1%	0.0%	-0.3%
	Alt. 3	1.0%	2.3%	1.2%	-0.6%	0.0%	-1.1%
	Alt. 4	0.2%	0.0%	0.2%	-0.1%	0.0%	0.0%

1 CVP exports include agricultural, refuge, municipal and industrial deliveries.
2 Table A, Article 56 and Article 21 components of SWP exports are shown.
3 CVP and SWP exports include water pumped at Jones and Banks pumping plants and water delivered to the South Bay water agencies in lieu of Jones and Banks pumping. Delta supply restoration deliveries to South Bay water agencies in Alternative 1 are not included.
4 CVP and SWP carry-over storage includes end of September storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs.

Alt. = alternative
CVP = Central Valley Project
SWP = State Water Project
TAF = thousand acre-feet

2030 Level of Development. CVP and SWP exports under each project alternative are compared to the Future Without Project. CVP and SWP exports do not change appreciably under any of the alternatives or fishery restrictions.

Table 4.2-9 presents the long-term average for CVP and SWP exports. The long-term average shows that decreases in CVP or SWP exports are no more than 0.2 percent for all project alternatives and both fishery restrictions.

Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. **Table 4.2-12** presents the below normal averages. **Table 4.2-13** presents the dry year averages.

Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal averages. Table 4.2-13 presents the dry year averages.

Table 4.2-14 presents the critical year averages. During critical years CVP and SWP exports increase compared to the Existing Condition. Decreases in CVP and SWP deliveries were less than 1 percent from the Existing Condition in all water year types and would not be expected to result in a significant effect on deliveries.

presents the critical year averages. Decreases in CVP and SWP deliveries were less than 1 percent from the Future Without Project condition in all water year types and would not be expected to result in a significant effect on deliveries.

CVP and SWP Carry-over Storage

The stored water remaining in reservoirs at the end of the water year in September is referred to as carry-over storage. In general, this quantity is representative of stored water that will be available for use in the following year. Decreases in carry-over storage in CVP and SWP reservoirs could mean that less water is available for delivery to CVP and SWP customers in following years. The total carry-over storage available to the CVP and SWP is a useful measure for evaluating the potential effects of the project alternatives on water supply. Total carry-over storage in Shasta, Trinity, Oroville, Folsom and San Luis reservoirs was used for this analysis.

2005 Level of Development. Carry-over storage under each project alternative was compared to the Existing Condition. The analysis shows that CVP and SWP carry-over storage under both levels of development would be essentially the same under the Existing Conditions compared to each of the project alternatives.

Table 4.2-9 presents the long-term average for carry-over storage. The long-term average shows that changes in carry-over storage are no more than 0.2 percent for all project alternatives and both fishery restrictions. Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal averages. Table 4.2-13 presents the dry year averages. Table 4.2-14 presents the critical year averages. Decreases in carry-over storage would be no more than 1 percent from the Existing Condition in all water year types and would not be expected to result in a significant effect on deliveries.

2030 Level of Development. Carry-over storage under each project alternative was compared to the Future Without Project. The analysis shows that CVP and SWP carry-over storage under both levels of development would be essentially the same under the Future Without Project condition compared to each of the project alternatives.

Table 4.2-9 presents the long-term average for carry-over storage. The long-term average shows that decreases in carry-over storage would be no more than 0.3 percent for all project alternatives and both fishery restrictions. Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal averages. Table 4.2-13 presents the dry year averages. Table 4.2-14 presents the critical year averages. Decreases in carry-over storage would be no more than 1 percent from the Future Without Project condition by water year type and would not be expected to result in a significant effect on deliveries.

Sacramento and San Joaquin River Flow

Sacramento River flow at Hood represents the largest source of water that enters the Delta. At this location, flow in the Sacramento River can include water released from Trinity, Shasta, Oroville, and Folsom reservoirs for delivery to CVP or SWP customers in or south of the Delta, or for environmental purposes. In the dry season of each year, and especially during dry years, the flow in the Sacramento River at Hood is largely controlled by releases from these reservoirs. At such times, the releases are often made by CVP and SWP operators to ensure compliance with Delta salinity or flow standards. Changes in Sacramento River flow at this location could indicate changes in Delta conditions, and could affect reservoir carry-over storage, which could then affect water supply for Delta water users, including CVP and SWP customers south of the Delta.

San Joaquin River flow at Vernalis represents another source of water that enters the Delta. At this location, flow in the San Joaquin River can include water released from CVP reservoirs to meet salinity control standards in the south Delta. Changes in San Joaquin River flow at Vernalis could indicate changed conditions in the Delta, which could affect reservoir carry-over storage, and thus affect deliveries to other water users.

2005 Level of Development. Sacramento and San Joaquin inflows under each project alternative were compared to the Existing Condition. The analysis shows that Sacramento and San Joaquin inflow would not change appreciably under any alternative compared to the Existing Conditions. Table 4.2-9 presents the long-term average of change in Sacramento and San Joaquin inflow. The long-term average shows no changes in inflow.

Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal averages. Table 4.2-13 presents the dry year averages.

Table 4.2-14 presents the critical year averages. During critical years, Sacramento inflow would decrease slightly, by less than 1 percent. San Joaquin inflow would remain the same during critical years. Decreases in Sacramento and San Joaquin inflow would be less than 1 percent from the Existing Condition for all water year types and would not be expected to result in a significant effect on deliveries.

2030 Level of Development. Sacramento and San Joaquin inflow under each project alternative was compared to the Future Without Project. The analysis shows that Sacramento and San Joaquin inflow would not change appreciably under any alternative compared to the Future Without Project. Table 4.2-9 presents the long-term average of change in Sacramento and San Joaquin inflow. The long-term average shows no changes in inflow.

Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal averages. Table 4.2-13 presents the dry year averages.

Table 4.2-14 presents the critical year averages. During critical years, Sacramento inflow would decrease slightly, by less than 1 percent. San Joaquin inflow would remain the same during critical years. Decreases in Sacramento and San Joaquin inflow would be less than 1 percent from the Future Without Project condition for all water year types and would not be expected to result in a significant effect on deliveries.

Net Delta Outflow

Net Delta outflow is an indicator of general Delta conditions. It represents the water that flows from the Delta into the San Francisco Bay. Relatively high net Delta outflow generally results in surplus Delta water supply and good Delta water quality. When Delta outflow is low, surplus water is generally not available in the Delta, and salt intrusion into the Delta from San Francisco Bay can occur. The Los Vaqueros Reservoir Expansion Project is designed to fill primarily with surplus Delta water, as part of the design to avoid impacts to other water users. This can reduce net Delta outflow at times when surplus Delta water supply is available, but would not affect water supply for other users.

2005 Level of Development. Net Delta outflow under each project alternative was compared to the Existing Condition. Table 4.2-9 presents the long-term average of change in net Delta outflow.

Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal year averages. Table 4.2-13 presents the dry year averages.

Table 4.2-14 presents the critical year averages. The analysis shows that net Delta outflow would decrease by less than 1 percent under Alternatives 1, 2 and 4 relative to the Existing Condition for all water year types. The decrease in net Delta outflow under Alternative 3 during critical years, assuming moderate fishery restrictions, would be 1.6 percent. These decreases would not be expected to significantly impact deliveries. They are discussed further below.

2030 Level of Development. Net Delta outflow under each project alternative was compared to the Future Without Project. Table 4.2-9 presents the long-term average of change in net Delta outflow.

Table 4.2-10 presents the wet year averages. Table 4.2-11 presents the above normal year averages. Table 4.2-12 presents the below normal year averages. Table 4.2-13 presents the dry year averages.

Table 4.2-14 presents the critical year averages. The analysis shows that net Delta outflow would decrease by less than 1 percent under Alternatives 1, 2 and 4 relative to the Future Without

Project condition for all water year types. Decrease in net Delta outflow under Alternative 3 during critical years assuming severe fishery restrictions would be 1.1 percent.

The small decrease in net Delta outflow represents additional diversions made by these project alternatives in times of surplus flow, when water supply for other Delta water users would not be affected. Because the project alternatives were not shown to adversely impact the direct measures of water supply for other users, including CVP and SWP exports, and because the Los Vaqueros Reservoir Expansion Project alternatives are designed to primarily use surplus Delta water, these small changes in net Delta outflow would not affect water supply for other users.

Alternatives 1 through 4

Alternatives 1 through 4 would result in no significant changes that would adversely affect deliveries to other water users. They would result in small changes in total Delta diversions, largely in periods with surplus flows, resulting in a more reliable water supply for the South Bay agencies, and no discernible changes in SWP and CVP water supply deliveries to other customers of those projects. It would not affect water supplies of other water users. Average Delta outflow changes would be less than significant in both magnitude and timing, decreasing by less than one half of 1 percent from the Existing and Future Without Project conditions. Changes to upstream flows and reservoir carryover storage would be less than significant and the water supplies of other water users would not be significantly impacted.

Mitigation: None required.

Impact 4.2.2: The project alternatives would not result in significant adverse changes in Delta water quality causing the violation of a water quality standard. (Less Than Significant Impact)

Delta water quality standards are established by the SWRCB in the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, which is discussed above in Section 4.2.1. These Delta water quality standards govern salinity at Rock Slough, Emmaton, Jersey Point, Brandt Bridge, Old River near Middle River, and Old River near Tracy Bridge, as shown in **Table 4.2-15**.

Salinity at the standards compliance locations was simulated using the DSM2 model throughout the Delta for the Existing and Future Without Project conditions and each of the project alternatives, as described in the preceding subsection titled Hydrology, Water Operations, Hydrodynamics, and Water Quality Models. Appendix C-5 presents complete model results of Delta water quality changes for each alternative.

Potential standards violations were found in all model runs, including the Existing Condition and Future Without Project runs. The apparent violations in the model results are referred to as "potential violations" because they occur in the model but would not occur in actual operations. The Delta is operated to meet water quality standards and would continue being operated to meet standards if the Los Vaqueros Reservoir Expansion Project is built.

TABLE 4.2-15
SUMMARY OF SELECTED WATER QUALITY STANDARDS IN THE DELTA

Compliance Location	Description	Value
Rock Slough	Maximum mean daily Cl	250 mg/L
Sacramento River at Emmaton	14-day running average of mean EC during the spring and summer months depending on water year type	0.45-2.78 mmhos/cm depending on water year type and time of year
San Joaquin River at Jersey Point	14-day running average of mean EC during the spring and summer months depending on water year type	0.45 -2.20 mmhos/cm depending on water year type and time of year
San Joaquin River at Brandt Bridge	Maximum 30-day running average of mean daily EC	Apr – Aug: 0.7 mmhos/cm Sep – Mar: 1.0 mmhos/cm
Old River near Middle River	Maximum 30-day running average of mean daily EC	Apr – Aug: 0.7 mmhos/cm Sep – Mar: 1.0 mmhos/cm
Old River at Tracy Bridge	Maximum 30-day running average of mean daily EC	Apr – Aug: 0.7 mmhos/cm Sep – Mar: 1.0 mmhos/cm

Cl = chloride
cm = centimeter
EC = electrical conductivity
mg/L = milligram(s) per liter
mmhos/cm = millimhos per centimeter

The apparent standards violations under the Existing and Future Without Project conditions are caused solely by modeling inadequacies which are discussed in more detail below and in the modeling section above. Apparent violations in the project alternatives modeling could also be caused by model inadequacies, like in the Existing and Future Without Project conditions, or could reflect the impacts of project alternative operations.

For some standards (Rock Slough, Emmaton, and Jersey Point), potential standards violations in the alternatives model results are caused solely by a mismatch between the CalSim II operations model and the DSM2 Delta hydrodynamics and mixing model, and are not caused by project operations. CalSim II defines flows into and out of the Delta such that these standards are met. A CalSim II – DSM2 mismatch occurs when the flows calculated by CalSim II are fed into the DSM2 hydrodynamics and mixing model and the salinity calculated by DSM2 does not meet the standards, as explained above in the Monthly Time Step description and in the DSM2 description. Modeled standards violations caused by DSM2- CalSim II mismatches occur because CalSim's monthly time step is not well suited to handling daily or 14-day standards, or running average standards that span more than 1 month. Furthermore, CalSim II uses empirical approximations for estimating Delta salinities that may not match the physically-based salinity calculations done in DSM2.

For other standards (San Joaquin River at Brandt Bridge, Old River near Middle River, and Old River at Tracy Road Bridge), potential standards violations in the model results for project alternatives could also be caused by CalSim II – DSM2 mismatches. However, CalSim II does not operate the SWP and CVP to meet these standards so it is also possible that potential violations at these sites in the model results reflect the impacts of project alternative operations.

A statistical analysis (chi-squared test) was performed to compare the occurrence of potential violations in the Existing and Future Without Project conditions and in each of the project alternatives. This analysis shows that the potential violations do not occur more often in any of the project alternatives than they do in the Existing and Future Without Project conditions. This finding supports the conclusion that the apparent violations of the Rock Slough, Emmaton, and Jersey Point standards in the model results are modeling artifacts, and suggests that apparent violations of the San Joaquin River at Brandt Bridge, Old River near Middle River, and Old River at Tracy Road Bridge are also modeling artifacts. Violations that are modeling artifacts would be expected to occur about as often in the Existing and Future Without Project conditions model runs as they do in the project alternatives runs, while potential violations caused by project operations would result in statistically significant increases in the number of violations under the alternatives as compared with the Existing and Future Without Project conditions.

The numbers of potential water quality standards violations in the Existing and Future Without Project conditions model runs were compared to the numbers of potential violations in the project alternatives model runs. The statistical analysis provides a means to determine (within certain limits of precision or confidence) whether the number of violations modeled under the alternatives was significantly different from the number modeled under the Existing and Future Without Project conditions. ("Significant" in this sense is a quantitative designation with a specific mathematical meaning based on the type of test used and the precision or confidence limits used.)

If no statistically significant difference occurred in the numbers of potential violations at a compliance location, then the potential violations found in the alternatives runs were attributed to modeling artifacts and it was determined that the project alternative would not be expected to cause standards violations. If a statistically significant difference occurred, then project alternative operations could potentially cause standards violations. See Appendix C-6 for complete details of the statistical analysis.

The analysis showed that none of the alternatives had a statistically significant increase in the frequency of potential standards violations at any of the stations compared to the Existing and Future Without Project conditions. This means that the changes in the frequency of potential standards violations are likely to be the result of modeling artifacts, and that changes to operations under the alternatives do not produce statistically significant differences from the Existing and Future Without Project conditions, with respect to Delta water quality standards. The alternatives would have less than significant impacts on compliance with water quality standards in the Delta.

Table 4.2-16 presents the number of days of standards violations in the Existing and Future Without Project conditions, and the changes in the number of days that standards could be violated under the project alternatives. The following paragraphs discuss the data and results for 2005 and 2030 levels of development.

TABLE 4.2-16
FREQUENCY OF POTENTIAL STANDARDS VIOLATIONS

		Rock Slough [days]	Sacramento River at Emmaton [days]	San Joaquin River at Jersey Pt [days]	San Joaquin at Brandt Bridge [days]	Old River near Middle River [days]	Old River at Tracy [days]
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Existing Condition		218	184	169	971	956	882
Change from Existing Condition	Alt. 1	-7	22	-5	-2	0	-3
	Alt. 2	-13	20	-7	-1	0	-1
	Alt. 3	7	20	8	-1	0	-3
	Alt. 4	-19	4	0	0	0	-1
Severe Fishery Restrictions							
Existing Condition		212	171	223	973	956	943
Change from Existing Condition	Alt. 1	12	0	2	1	0	1
	Alt. 2	15	-1	1	1	0	1
	Alt. 3	22	2	2	0	0	-1
	Alt. 4	15	1	2	0	0	0
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Future Without Project		442	247	327	554	472	503
Change from Existing Condition	Alt. 1	-107	-4	13	1	1	4
	Alt. 2	-85	-1	23	2	0	2
	Alt. 3	-107	-12	-7	-5	0	0
	Alt. 4	-19	1	3	0	0	1
Severe Fishery Restrictions							
Future Without Project		451	220	359	540	474	544
Change from Existing Condition	Alt. 1	-30	12	21	-1	1	5
	Alt. 2	-26	19	17	-1	0	2
	Alt. 3	-77	-3	-4	3	1	-3
	Alt. 4	-33	1	-3	0	0	-1

Alt. = alternative

2005 Level of Development. Comparison of potential standards violations shows that the numbers of potential violations under all project alternatives would be about equal to the number of potential violations under the Existing Condition. Statistical analysis confirms that no statistically significant changes exist in the numbers of potential violations, which supports the conclusion that the alternatives would have less than significant impacts on compliance with water quality standards in the Delta.

2030 Level of Development. Comparison of potential standards violations shows that the numbers of potential violations under all project alternatives would be about equal to the number of potential violations under the Future Without Project condition. Statistical analysis confirms that the only statistically significant changes in the numbers of violations are improvements in compliance with the Rock Slough standard in Alternatives 1, 2, and 3 under the moderate fishery restrictions and in Alternative 3 under severe fishery restrictions. These results support the conclusion that the alternatives would have less than significant impacts on compliance with water quality standards in the Delta.

Alternative 1

Compared to the Existing and Future Without Project conditions, the operation of Alternative 1 would not result in significant adverse changes in Delta water quality standards compliance. The only significant difference between Alternative 1 and the Existing of Future Without Project conditions in standards compliance were found at Rock Slough, where there would be a reduced likelihood of water quality standard violations under the 2030 level of development. (See Table 4.2-16.) No statistically significant differences in the number of potential standards violations were found at any other water quality stations under any of the modeling scenarios. Alternative 1 would have less than significant impacts on compliance with water quality standards in the Delta.

Alternative 2

The operation of Alternative 2 as compared with both Existing and Future Without Project conditions would have results nearly identical to Alternative 1. There would be improvements in standards compliance at Rock Slough under the moderate fishery restrictions and 2030 level of development. (See Table 4.2-16) No statistically significant differences were found at any other stations. Alternative 2 would have less than significant impacts on compliance with water quality standards in the Delta.

Alternative 3

Under Alternative 3, water quality improvements were also found at Rock Slough under both moderate and severe fishery restrictions. (See Table 4.2-16.) No significant differences in numbers of potential standards violations were found at any other stations. Alternative 3 would have less than significant impacts on compliance with water quality standards in the Delta.

Alternative 4

No significant differences appeared in the numbers of standards violations found at any standard compliance stations. Alternative 4 would have less than significant impacts on compliance with water quality standards in the Delta. (See Table 4.2-16.)

Mitigation: None required.

Impact 4.2.3: The project alternatives would not result in changes to Delta water quality that would result in significant adverse effects on beneficial uses. (Less Than Significant Impact)

Changes in timing and location of diversions have the potential to affect water quality conditions in the Delta so as to adversely affect beneficial uses. To assess these effects, estimated Delta salinity concentrations were compared between each project alternative and the Existing or Future Without Project conditions under the 2005 and 2030 levels of development. Potential beneficial use impacts were assessed at current and proposed drinking water intakes by examining both long-term average changes in salinity and sizable short-term changes in salinity. The intakes include Jones Pumping Plant, Clifton Court Forebay, Barker Slough at the North Bay Aqueduct intake, Cache Slough at the City of Vallejo Intake, and the proposed City of Stockton Delta Intake. A complete analysis of water quality changes is provided in Appendix C-5.

Long-term Changes in Salinity

Table 4.2-17 presents modeled long-term salinity for Existing and Future Without Project conditions and the modeled changes in salinity for each alternative. At some intakes under some alternatives the model shows no change in long-term average salinity, and at some intakes under some alternatives the model shows small changes in long-term average salinity. Some of these changes are increases and some are decreases, but in only a single case does the magnitude of the change exceed 0.5 percent. The exception at Barker Slough for Alternative 3 is discussed in more detail below. The magnitude of changes as well as the fact that in some cases salinity improved slightly and in others it degraded by similar amounts would further indicate that the changes are on the whole not significant.

2005 Level of Development

Clifton Court Forebay. On average, small increases in salinity, less than 0.3 percent, were found at Clifton Court Forebay for Alternatives 1, 2, and 3 under both moderate and severe fishery restrictions. A small decrease in salinity occurred at Clifton Court Forebay for Alternative 4 under moderate fishery restrictions and no change occurred under severe fishery restrictions.

Jones Pumping Plant. Changes at Jones Pumping Plant were nearly identical to those at Clifton Court Forebay.

City of Stockton Delta Intake. At the City of Stockton Delta Intake small increases in salinity were found for all of the alternatives under both moderate and severe fishery restrictions.

Barker Slough North Bay Aqueduct. All alternatives except Alternative 3 showed small decreases in salinity at Barker Slough under moderate fishery restrictions. For Alternative 3 under moderate fishery restrictions a 1 percent increase in salinity occurred at Barker Slough; the only instance of any change greater than 0.5 percent. Further investigation found that the 1 percent increase was influenced by an isolated event involving changes not related to the alternative under evaluation, and it was concluded that this estimated difference in Barker Slough water quality does not reflect an impact that would be caused by the Alternative 3 operations.

TABLE 4.2-17
SUMMARY OF LONG-TERM SALINITY CHANGES AT DELTA INTAKES

		Entrance to Clifton Court Forebay [µS/cm]	Jones Pumping Plant [µS/cm]	City of Stockton Delta Intake [µS/cm]	Barker Slough at North Bay Aqueduct Intake [µS/cm]	Cache Slough at City of Vallejo Intake [µS/cm]
2005 LEVEL OF DEVELOPMENT						
Moderate Fishery Restrictions						
Existing Condition		529	549	376	279	294
Percent Change from Existing Condition	Alt. 1	0.2%	0.1%	0.2%	-0.1%	0.0%
	Alt. 2	0.3%	0.1%	0.1%	-0.1%	0.0%
	Alt. 3	0.1%	0.1%	0.4%	1.0%	0.0%
	Alt. 4	-0.1%	-0.1%	0.0%	-0.1%	0.0%
Severe Fishery Restrictions						
Existing Condition		549	571	392	279	294
Percent Change from Existing Condition	Alt. 1	0.2%	0.2%	0.1%	-0.1%	0.0%
	Alt. 2	0.3%	0.2%	0.1%	-0.1%	0.0%
	Alt. 3	0.0%	0.0%	0.1%	-0.4%	0.0%
	Alt. 4	0.0%	0.0%	0.0%	-0.1%	0.0%
2030 LEVEL OF DEVELOPMENT						
Moderate Fishery Restrictions						
Future Without Project		533	547	376	262	293
Percent Change from Existing Condition	Alt. 1	-0.3%	-0.2%	-0.5%	0.1%	0.1%
	Alt. 2	-0.1%	-0.1%	-0.4%	0.1%	0.0%
	Alt. 3	-0.4%	-0.3%	-0.3%	0.1%	0.0%
	Alt. 4	-0.1%	-0.1%	-0.2%	0.0%	0.0%
Severe Fishery Restrictions						
Future Without Project		553	569	391	265	293
Percent Change from Existing Condition	Alt. 1	0.1%	0.1%	0.0%	0.0%	0.0%
	Alt. 2	0.1%	0.1%	-0.1%	0.0%	0.0%
	Alt. 3	0.1%	0.0%	0.4%	0.3%	0.0%
	Alt. 4	-0.1%	-0.1%	-0.1%	0.0%	0.0%

Alt. = alternative
µS/cm = microSiemens per centimeter

Cache Slough. All of the alternatives showed no change in the salinity at Cache Slough Vallejo Intake under both moderate and severe fishery restrictions.

2030 Level of Development

Clifton Court Forebay. All alternatives showed small decreases in salinity at Clifton Court Forebay under moderate fishery restrictions. Under severe restrictions, Alternatives 1, 2, and 3 showed small increases in salinity at Clifton Court Forebay and Alternative 4 showed a small decrease.

Jones Pumping Plant. The changes in salinity at Jones Pumping Plant were nearly identical to those at Clifton Court Forebay.

City of Stockton Delta Intake. At the City of Stockton Delta Intake, small decreases in salinity occurred under moderate fishery restrictions for all alternatives. Under severe fishery restrictions, Alternative 1 showed no change, Alternative 2 showed a small decrease, Alternative 3 showed a small increase, and Alternative 4 showed a small decrease at the City of Stockton's intake.

Barker Slough North Bay Aqueduct. Small increases in salinity occurred at Barker Slough for Alternatives 1, 2, and 3 under moderate fishery restrictions; Alternative 4 showed no change. Alternative 3 showed a small increase in salinity at Barker Slough under severe fishery restrictions and the other alternatives showed no change.

Cache Slough City of Vallejo. Alternative 1 showed a small increase in salinity at Cache Slough under moderate fishery restrictions and the other alternatives showed no changes.

Short-term Changes in Salinity

Although the long-term average changes in salinity would be very small and would not significantly affect beneficial uses, changes in operations under the alternatives could impact beneficial uses if there were consistent but sizable changes in short-term salinity. Sizable short-term changes in salinity were analyzed at Jones Pumping Plant, Clifton Court Forebay, Barker Slough, Cache Slough, City of Stockton Delta Intake, and Antioch.

A sizable increase in salinity was defined as a monthly average salinity difference between a project alternative and the Existing or Future Without Project conditions that is greater than 5 percent and greater than 5 mg/ L Cl. A sizable decrease in salinity was defined as a monthly average salinity difference between a project alternative and the Existing or Future Without Project conditions that is less than -5 percent and less than -5 mg/L Cl.

Sizable salinity changes at the City of Antioch intake were defined separately because an operational threshold is established at that location, and effects on the beneficial use of water could be caused by changing the amount of time that Antioch's source water salinity is below that threshold. When Cl concentration is greater than 250 mg/L, the City of Antioch uses water from other sources. If the monthly average Cl concentration was modeled for the Existing or Future Without Project conditions as less than 250 mg/L, and operations under a project alternative increased the concentration to 250 mg/L Cl or more, the month was flagged as showing a sizable increase in salinity. Conversely, if the monthly average Cl concentration was modeled as greater than 250 mg/L under the Existing or Future Without Project conditions, and was lowered below 250 mg/L Cl under a project alternative, a sizable salinity decrease was indicated for that month.

Sizable changes in salinity modeled under a project alternative could be due to two factors:

- CalSim II threshold sensitivity, as explained in the preceding Threshold Sensitivity in CalSim II section. Sizable changes in salinity caused by CalSim II threshold sensitivity are modeling artifacts rather than genuine project impacts. CalSim II threshold sensitivity would be expected to result in about the same numbers of sizable salinity decreases and sizable salinity increases in the project alternatives modeling runs as in the Existing or Future Without Project conditions modeling runs.

- Effects of project alternative operations. Water quality standards violations that are caused by project alternative operations and are not modeling artifacts would lead to a statistically significant difference between the number of sizable increases in salinity and the number of sizable decreases in salinity in the project alternatives modeling runs, as compared to the Existing or Future Without Project conditions model runs.

A statistical analysis (one-tailed binomial test),was performed to determine whether sizable changes in salinity found in the project alternatives model runs were the result of project alternative operations. The analysis was based on comparing the numbers of sizable salinity increases to sizable decreases. If no statistically significant difference occurred in the numbers of increases compared to decreases, then the changes found in the project alternatives runs were attributed to threshold sensitivity. If a statistically significant difference occurred, then project alternative operations could cause impacts. See Appendix C-6 for complete details of the statistical analysis.

In this analysis, none of the project alternatives had more statistically significant sizable salinity increases than decreases except for Barker Slough under Alternative 3 conditions. This difference is discussed in more detail below. **Table 4.2-18** presents the numbers of sizable changes in salinity at the drinking water intakes. The data and results are discussed below for 2005 and 2030 levels of development.

2005 Level of Development. Under the 2005 level of development, the numbers of short-term sizable changes in salinity at existing and proposed drinking water intakes are generally low, and the numbers of sizable decreases in salinity are comparable to the numbers of sizable increases, as shown in Table 4.2-18**.** Statistical analysis confirms that no statistically significant difference exists between salinity decreases and increases in any project alternative, with the single exception of Barker Slough in Alternative 3 under moderate fishery restrictions.

Further investigation found that the number of sizable salinity increases at Barker Slough under the aforementioned conditions was influenced by an event lasting several consecutive months where changes not related to Alternative 3 operations caused the changes in salinity. It was concluded that this estimated difference in Barker Slough water quality does not reflect an impact that would be caused by the Alternative 3 operations. The statistical analysis supports the conclusion that project alternative operations would not cause changes in short-term water quality that would adversely affect beneficial uses.

2030 Level of Development. Under the 2030 level of development, the numbers of sizable short-term changes in salinity at existing and proposed drinking water intakes are generally low and the numbers of sizable decreases in salinity are comparable to the numbers of sizable increases, as shown in Table 4.2-18**.** Statistical analysis confirms that no statistically significant difference exists between salinity decreases and increases under any project alternative. Project alternative operations would not cause changes in short-term water quality that would adversely affect beneficial uses.

TABLE 4.2-18
FREQUENCY OF SIZABLE CHANGES IN SALINITY AT DRINKING WATER INTAKES

	Jones Pumping [months]		Clifton Court Forebay [months]		Barker Slough [months]		Cache Slough [months]		City of Stockton Delta Intake [months]		Antioch [months]	
	Sizable Salinity Increase	Sizable Salinity Decrease	Sizable Salinity Increase	Sizable Salinity Decrease	Sizable Salinity Increase	Sizable Salinity Decrease	Sizable Salinity Increase	Sizable Salinity Decrease	Sizable Salinity Increase	Sizable Salinity Decrease	Sizable Salinity Increase	Sizable Salinity Decrease
2005 LEVEL OF DEVELOPMENT												
Moderate Fishery Restrictions												
Existing Condition												
Alt. 1	3	3	4	2	0	2	0	1	2	1	0	0
Alt. 2	3	1	4	0	0	3	0	0	2	0	0	0
Alt. 3	3	2	4	2	10	0	0	1	8	2	1	0
Alt. 4	0	0	0	0	0	1	0	0	0	1	1	0
Severe Fishery Restrictions												
Existing Condition												
Alt. 1	2	0	3	0	0	0	0	0	1	0	1	1
Alt. 2	2	0	4	0	0	0	0	0	1	0	0	1
Alt. 3	1	0	1	0	0	0	0	0	1	0	1	0
Alt. 4	0	0	0	0	0	0	0	0	0	0	0	0
2030 LEVEL OF DEVELOPMENT												
Moderate Fishery Restrictions												
Future Condition												
Alt. 1	4	4	6	5	2	0	0	0	4	11	1	0
Alt. 2	6	3	8	3	2	0	0	0	5	7	1	0
Alt. 3	5	10	5	11	2	0	0	0	5	13	0	0
Alt. 4	0	1	0	1	0	0	0	0	0	2	0	0
Severe Fishery Restrictions												
Future Condition												
Alt. 1	5	3	7	5	0	0	0	0	4	5	0	0
Alt. 2	4	3	9	4	0	0	0	0	5	4	0	0
Alt. 3	7	6	7	7	1	0	0	0	9	7	1	0
Alt. 4	1	4	1	5	0	0	0	0	1	3	0	0

Alternative 1

Compared to the Existing and Future Without Project conditions, the operation of Alternative 1 would not result in significant long-term or short-term changes in Delta water quality that would adversely affect beneficial uses.

Alternative 2

Compared to the Existing and Future Without Project conditions, the operation of Alternative 2 would not result in significant long-term or short-term changes in Delta water quality that would adversely affect beneficial uses.

Alternative 3

Compared to the Existing and Future Without Project conditions, the operation of Alternative 3 would not result in significant long-term or short-term changes in Delta water quality that would adversely affect beneficial uses. The apparent change in Barker Slough water quality between the Existing Condition and the Alternative 3 scenario under the 2005 level of development with moderate fishery restrictions was not found to be caused by project operations. It was concluded that this estimated difference in Barker Slough water quality does not reflect an impact that would be caused by the Alternative 3 operations.

Alternative 4

Compared to the Existing and Future Without Project conditions, the operation of Alternative 4 would not result in significant long-term or short-term changes in Delta water quality that would adversely affect beneficial uses.

Mitigation: None required.

Impact 4.2.4: Diversions of Delta water under the project alternatives would not result in a significant reduction of Delta water levels. (Less Than Significant Impact)

Delta water users have a substantial interest in maintaining Delta water levels so that their siphons and pumps, installed at fixed elevations, can continue to divert water onto Delta islands for agricultural irrigation. To evaluate water level effects of the project alternatives, modeling results were examined for sites in the vicinity of the Los Vaqueros system intakes, and at the four monitoring locations identified in the CVP/SWP Joint Point of Diversions Water Level Response Plan.

Table 4.2-19 presents a summary of model results showing the changes in water level at lower-low tide during irrigation season. Delta agricultural irrigation users are primarily concerned with effects on the water level at lower-low tide because it represents the minimum water level they would experience. Irrigation season is assumed to be April through September. Complete model estimates of Delta water level changes are presented in Appendix C-5.

TABLE 4.2-19
LARGEST WATER LEVEL DECREASE AT LOWER-LOW TIDE IN IRRIGATION SEASON (in feet)

		Doughty Cut above Grant Line Canal Barrier	Old River near Tracy Road Bridge	Middle River near Howard Road Bridge	East of Coney Island	Old River Intake	AIP Intake
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Change from Existing Condition	Alt. 1	-0.07	-0.10	-0.06	-0.11	-0.08	-0.10
	Alt. 2	-0.05	-0.05	-0.04	-0.06	-0.05	-0.06
	Alt. 3	-0.17	-0.23	-0.12	-0.22	-0.15	-0.19
	Alt. 4	-0.02	-0.02	-0.01	-0.02	-0.01	-0.02
Severe Fishery Restrictions							
Change from Existing Condition	Alt. 1	-0.05	-0.06	-0.06	-0.07	-0.05	-0.06
	Alt. 2	-0.04	-0.05	-0.06	-0.06	-0.05	-0.06
	Alt. 3	-0.08	-0.09	-0.05	-0.04	-0.03	-0.04
	Alt. 4	-0.04	-0.05	-0.03	-0.02	-0.02	-0.03
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Change from Future Without Project	Alt. 1	-0.05	-0.05	-0.05	-0.08	-0.07	-0.08
	Alt. 2	-0.05	-0.05	-0.05	-0.08	-0.07	-0.08
	Alt. 3	-0.08	-0.08	-0.09	-0.07	-0.05	-0.06
	Alt. 4	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Severe Fishery Restrictions							
Change from Future Without Project	Alt. 1	-0.04	-0.05	-0.04	-0.07	-0.07	-0.07
	Alt. 2	-0.04	-0.05	-0.04	-0.07	-0.07	-0.07
	Alt. 3	-0.06	-0.10	-0.06	-0.06	-0.06	-0.05
	Alt. 4	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02

NOTES: Irrigation season is assumed to be April through September

AIP = Alternative Intake Project
Alt. = alternative

Table 4.2-20 presents the frequency at which water level decreases exceed 0.1 foot during the typical irrigation season. Water level changes of less than 0.1 foot would be difficult to measure, and are within the level of accuracy of the model tools used for this analysis.

2005 Level of Development. Table 4.2-20 presents the frequency at which water-level decreases exceed 0.1 foot during the typical irrigation season. Water level changes of less than 0.1 foot would be difficult to measure, and are within the level of accuracy of the model tools used for this analysis.

TABLE 4.2-20
PERCENT OF TIME WHEN MAXIMUM DECREASE IN WATER LEVEL EXCEEDS 0.1 FOOT

		Doughty Cut above Grant Line Canal Barrier	Old River near Tracy Road Bridge	Middle River near Howard Road Bridge	East of Coney Island	Old River Intake	AIP
2005 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Percent Change from Existing Condition	Alt. 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 3	0.0%	0.1%	0.0%	0.9%	0.8%	0.8%
	Alt. 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Percent Change from Existing Condition	Alt. 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2030 LEVEL OF DEVELOPMENT							
Moderate Fishery Restrictions							
Percent Change from Future Without Project	Alt. 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Severe Fishery Restrictions							
Percent Change from Future Without Project	Alt. 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.00%
	Alt. 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt. 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

NOTES: Irrigation season is assumed to be April through September

% = percent
AIP = Alternative Intake Project
Alt. = alternative

As shown in Table 4.2-19, the maximum estimated decrease in water level at lower-low tide is less than 0.1 foot (less than 1.5 inches) in nearly all of the alternatives at the 2005 level of development. The only exceptions are Alternative 1 at the east of Coney Island location under moderate fishery restrictions, which has a maximum decrease of 0.11 foot (less than 1.5 inches), and Alternative 3 under moderate fishery restrictions, which had maximum water level decreases of greater than a tenth of a foot at all locations evaluated, the largest being 0.23 foot (less than 3 inches) at Old River near Tracy Road Bridge.

Table 4.2-20 shows how often the maximum decrease in water level exceeds 0.1 foot. This condition occurs only once (which is less than 0.1 percent of the time) over the 16-year study period in Alternative 1 at the east of Coney Island location, and this condition did not occur at all at the other locations evaluated for this alternative. The water level decreased by more than 0.1 foot less than 1 percent of the time over the 16-year study period at the locations evaluated in Alternative 3 under moderate fishery restrictions. Water levels never decreased by more than 0.1 foot at the locations evaluated in Alternatives 2 and 4.

2030 Level of Development. Table 4.2-20 shows the frequency at which water level decreases exceed 0.1 foot during the typical irrigation season. Water level changes below 0.1 foot would be difficult to measure, and are within the level of accuracy of the model tools used for this analysis.

Table 4.2-19, the maximum estimated decrease in water level at lower-low tide is less than 0.1 foot (less than 1.2 inches) at each of the locations evaluated in all four alternatives. Table 4.2-20 shows how often the maximum decrease in water level would exceed 0.1 foot. As shown, this condition would not occur at the locations evaluated in the project alternatives.

The results of this comparison show that all of the project alternatives would have a less than significant impact on Delta water levels.

Alternative 1

Alternative 1 would result in water level changes so small that they would be difficult to measure. The largest change estimated at lower-low tide would be -0.11 foot, which is less than 1.5 inches, and would occur infrequently (once during an irrigation season in a 16-year study period). A change in water level surface elevation of this magnitude and frequency would not affect the ability of local water users to divert water for their beneficial uses. Therefore, this impact would be less than significant.

Alternative 2

Alternative 2 would result in water level changes so small that they would be difficult to measure. The largest change estimated at lower-low tide during irrigation season would be 0.08 foot, or about 1 inch, and the estimated decrease in water level would not exceed 0.1 foot during irrigation season. A change in water level surface elevation of this magnitude would not affect the ability of local water users to divert water for their beneficial uses. Therefore, this impact would be less than significant.

Alternative 3

Alternative 3 would most often result in water level changes so small that they would be difficult to measure. The largest estimated change at lower-low tide during irrigation season would be 0.23 foot, which is less than 3 inches, and water level decreases greater than 0.1 foot would occur less than 1 percent of the time during the irrigation season. A change in water level surface elevation of this magnitude and frequency would not affect the ability of local water users to divert water for their beneficial uses. Therefore, this impact would be less than significant.

Alternative 4

Alternative 4 would result in water level changes so small that they would be difficult to measure. The largest change estimated at lower-low tide during irrigation season would be 0.05 foot, and the estimated decrease in water level would not exceed 0.1 foot during the irrigation season. A change in water level surface elevation of this magnitude would not affect the ability of local water users to divert water for their beneficial uses. Therefore, this impact would be less than significant.

Mitigation: None required.

Impact 4.2.5: The project alternatives would not result in a cumulatively considerable contribution to significant adverse cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels. (Less Than Significant Impact)

All Alternatives

A cumulative impact arises when two or more individual effects which, when considered together, are considerable, or which compound or increase other environmental impacts. Cumulative impacts can result from individually minor but collectively significant impacts, meaning that the project's incremental effects must be viewed in connection with the effects of past, current, and probable future projects.

Cumulative impacts were determined considering the reasonably foreseeable projects described in Section 4.1.2. The foreseeable future projects or operational conditions that could combine with the impacts of the project alternatives are included in the Common Assumptions for the 2030 level of development conditions in the statewide operations model (CalSim II) and Delta water quality model (DSM2). The assumptions and projects included in the model analyses of 2030 level of development include the following:

- Future level of development, including population growth and land-use changes
- South Delta Improvements Program Phase 1 (permanent operable barriers in the south Delta)
- CCWD Rock Slough Canal Replacement
- Delta-Mendota Canal-California Aqueduct Intertie
- Freeport Regional Water Project, including delivery of 3.2 TAF per year of CCWD CVP water supply from the Freeport intake through the CCWD- East Bay Municipal Utility District intertie to CCWD
- A limited Environmental Water Account program
- Revised operations for SWP and CVP instituting modified export pumping rules to address Delta fishery protection to represent future assumed operations associated with OCAP reconsultation on biological opinions for delta smelt and chinook salmon

The analysis of the 2030 level of development described under each impact discussion in this section therefore is an analysis of the project's contribution to cumulative impacts, and shows that in the context of combined reasonably foreseeable future development, the project alternatives would not result in a cumulatively considerable contribution to significant cumulative impact on Delta hydrology or water quality. The results of the analyses show that the Delta inflows, outflows, water levels, and water quality, as well as both CVP and SWP deliveries, remain largely unchanged in the Future Without Project condition compared to the Existing Condition, and in the existing or future conditions with the project alternatives.

Additional future projects or operational influences that are not included in the statewide operations model (CalSim II) and Delta water quality model (DSM2) include:

- Stockton Drinking Water Supply Project (DWSP)
- Bay Delta Conservation Plan (BDCP)

Operational permits have not been issued for the Stockton DWSP. Because specific information on the operation of the project was unavailable, it was not included quantitatively in the modeling used in this cumulative impacts analysis. However, the Stockton DWSP is anticipated to have negligible effects on Delta water supply, water quality, and water levels. Accordingly, the effects of operating the Stockton DWSP are not likely to influence or change the conclusions of this cumulative analysis.

As described in Chapter 2, the BDCP is in the early stages of planning, and quantitative information available from that planning process is insufficient for inclusion in this cumulative impacts analysis.

The impacts analyses performed for the project alternatives using assumptions for future level of development indicate no cumulative impact.

The project alternatives are in part a response to changes in Delta water supply that have already occurred and to additional Delta water supply challenges expected in the future. The project alternatives are designed to improve environmental water management and water supply reliability without substantially adversely affecting water supply and quality for others. The potential changes caused by project alternative operations are based on conservative assumptions about Delta and CCWD operations. The determination that the project alternative's contribution to cumulative impacts would not be significant takes into account the combined impact of existing and future projects, as described above.

A number of future projects and situations might result in Delta water quality degradation and decreased supply, including climate change, population growth, increased water use, wastewater discharges, specific legal rulings, as well as other projects in the Delta. Regardless of whether future cumulative increases in salinity and decreases in water supply are considered to be a significant adverse impact on Delta water users, the changes caused by the project alternatives would remain small and they would not be cumulatively considerable in the context of combined past, present, and probable future projects. These future projects will not change the overall impact of the project alternatives or the conclusion that the alternative's contribution to a significant cumulative effect would not be considerable.

Mitigation: None required.

4.3 Delta Fisheries and Aquatic Resources

This section describes the existing fishery and aquatic habitat conditions within the Bay-Delta estuary that would potentially be affected by the Los Vaqueros Reservoir Expansion Project, presents the applicable regulatory background, provides an assessment of potential fisheries and aquatic resources effects, and, where appropriate, identifies suitable mitigation to reduce potentially significant impacts to a less-than-significant level.

4.3.1 Affected Environment

Regulatory Setting

Federal

Federal Endangered Species Act

Under the Federal Endangered Species Act (FESA), the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (United States Code [USC], Title 16, Section 1533[c]). FESA prohibits the “take” of endangered or threatened fish and wildlife species, the take of endangered or threatened plants in areas under federal jurisdiction or in violation of state law, or adverse modifications to their critical habitat. Under FESA, the definition of “take” is to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NMFS) also interpret the definition of “harm” to include significant habitat modification that could result in the take of a species.

If an activity would result in the take of a federally listed species, one of the following is required: an incidental take permit under Section 10(a) of FESA, or an incidental take statement issued pursuant to federal interagency consultation under Section 7 of FESA. Such authorization typically requires various measures to avoid and minimize species take, and to protect the species and avoid jeopardy to the species’ continued existence.

Pursuant to the requirements of Section 7 of FESA, a federal agency reviewing a proposed project which it may authorize, fund, or carry out must determine whether any federally listed threatened or endangered species, or species proposed for federal listing, may be present in the project area and determine whether implementation of the proposed project is likely to affect the species. In addition, the federal agency is required to determine whether a proposed project is likely to jeopardize the continued existence of a listed species or any species proposed to be listed under FESA or result in the destruction or adverse modification of critical habitat proposed or designated for such species (16 USC 1536[3], [4]).

NMFS administers FESA for marine fish species, including anadromous salmonids such as Central Valley steelhead, winter-run and spring-run chinook salmon, and green sturgeon. USFWS administers FESA for non-anadromous and non-marine fish species such as delta smelt (and longfin smelt, which has been recently proposed for listing). Projects for which a federally listed species is present and likely to be affected by an existing or proposed project must receive authorization from USFWS and/or NMFS. Authorization may involve a letter of concurrence that the project will not result in the potential take of a listed species, or may result in the issuance of a Biological Opinion (BO) that describes measures that must be undertaken to minimize the likelihood of an incidental take of a listed species. A project that is determined by NMFS or USFWS to jeopardize the continued existence of a listed species cannot be approved under a BO.

Where a federal agency is not authorizing, funding, or carrying out a project, take that is incidental to the lawful operation of a project may be permitted pursuant to Section 10(a) of FESA through approval of a habitat conservation plan (HCP).

FESA requires the federal government to designate "critical habitat" for any species it lists under the Endangered Species Act. "Critical habitat" is defined as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to the species conservation, and those features that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Implementation of the State Water Project (SWP) and Central Valley Project (CVP) coordinated Operations Criteria and Plan (OCAP), under which the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) and California Department of Water Resources (DWR) jointly manage dam releases to the Delta and exports from the Delta, is a key factor affecting hydrology and aquatic habitat conditions within the Bay-Delta estuary. This is described in Chapter 2 and Appendix C-3.

Magnuson-Stevens Fishery Conservation and Management Act – Essential Fish Habitat

The Pacific Fishery Management Council (PFMC) has designated the Delta, San Francisco Bay, and Suisun Bay as Essential Fish Habitat (EFH) to protect and enhance habitat for coastal marine fish and macroinvertebrate species that support commercial fisheries such as Pacific salmon. The amended Magnuson-Stevens Fishery Conservation and Management Act, also known as the Sustainable Fisheries Act (Public Law 104-297), requires that all federal agencies consult with NMFS on activities or proposed activities authorized, funded, or undertaken by that agency that may adversely affect EFH of commercially managed marine and anadromous fish species.

As part of the OCAP Biological Assessment, Reclamation and DWR have addressed anticipated effects of SWP and CVP operations on EFH within the Bay-Delta estuary for use in the reconsultation for compliance with the Act. The EFH provisions of the Sustainable Fisheries Act are designed to protect fishery habitat from being lost due to disturbance and degradation. The Act requires that EFH must be identified for all species federally managed by the PFMC, which is responsible for managing commercial fishery resources along the coasts of Washington, Oregon, and California. Three fishery management plans cover species that occur in the project area, and designate EFH within the entire Bay-Delta estuary:

- Pacific Groundfish Fishery Management Plan: starry flounder
- Coastal Pelagic Fishery Management Plan: northern anchovy and Pacific sardine
- Pacific Salmon Fishery Management Plan: chinook salmon

Clean Water Act

The U.S. Army Corps of Engineers (USACE) administers a number of laws and programs designed to protect fish and wildlife resources. Principal of these, with respect to the project alternatives, is Section 404 of the Clean Water Act. Section 404 regulates activities in wetlands and "other waters of the United States." Wetlands are a subset of waters of the U.S., which are defined in the Code of Federal Regulations (33 CFR 328.3[a]; 40 CFR 230.3[s]) as:

1. All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide
2. All interstate waters including interstate wetlands. Wetlands are defined by the federal government [33 CFR 328.3(b), 1991] as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce including any such waters
    - Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    - From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    - Which are used or could be used for industrial purposes by industries in interstate commerce.
4. All impoundments of waters otherwise defined as waters of the United States under the definition
5. Tributaries of waters identified in paragraphs (1) through (4)
6. The territorial sea
7. Wetlands adjacent to waters identified in paragraphs (1) through (6)

State

California Endangered Species Act

Pursuant to the California Endangered Species Act (CESA) and Section 2081 of the California Fish and Game Code, a permit from the California Department of Fish and Game (CDFG) is required for activities that could result in the take of a state-listed threatened or endangered species (i.e., species listed under CESA). The definition of “take” is to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (Fish and Game Code Section 86).

The state definition does not include “harm” or “harass,” as the federal definition does. As a result, the threshold for take under CESA is typically higher than that under FESA. Section 2080 of the Fish and Game Code prohibits the taking of plants and animals listed under the authority of CESA, except as otherwise permitted under Fish and Game Code Sections 2080.1, 2081, and 2835. Under CESA, the California Fish and Game Commission maintains a list of threatened species and endangered species (Fish and Game Code Section 2070). The California Fish and Game Commission also maintains two additional lists:

- Candidate species (CDFG has issued a formal notice that the species is under review for addition to either the list of endangered species or the list of threatened species such as longfin smelt)
- Species of special concern, which serves as a watch list

Consistent with the requirements of CESA, a lead agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in a proposed project area and determine whether the proposed project may take a listed species. If a take would occur, an incidental take permit would be required from the CDFG, including a mitigation plan that provides measures to minimize and fully mitigate the impacts of the take. The measures must be roughly proportional in extent to the impact of the taking and must be capable of successful implementation. Issuance of an incidental take permit may not jeopardize the continued existence of a state-listed species. For species that are also listed as threatened or endangered under the FESA, CDFG may rely on a federal incidental take statement or incidental take permit to authorize an incidental take under CESA.

Streambed Alteration Agreements

The state’s authority to regulate activities in waters of the U.S. resides primarily with CDFG. CDFG provides comment on USACE permit actions under the Fish and Wildlife Coordination Act. CDFG is also authorized under California Fish and Game Code Sections 1600–1616 to develop mitigation measures and enter into streambed alteration agreements with applicants whose projects would obstruct the flow or alter the bed, channel, or bank of a river or stream, including intermittent and ephemeral streams, in which a fish or wildlife resource is present.

Regional Water Quality Control Board

The Federal Clean Water Act, in Section 401, specifies that states must certify that any activity subject to a permit issued by a federal agency, such as USACE, meets all state water quality standards. In California, the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) are responsible for certifying activities subject to any permit issued by USACE pursuant to Section 404 or pursuant to Section 10 of the Rivers and Harbors Act of 1899. Such certification actions, also known as a 401 certification or water quality certification, include issuing a 401 certification that the activity subject to the federal permit complies with state water quality standards, issuing a 401 certification with conditions, denying 401 certification, or denying 401 certification without prejudice, should procedural matters preclude taking timely action on a 401 certification application. Should 401 certification be denied, the federal permit is deemed denied also.

Regional boards or their executive officers may issue 401 certifications. The State Board issues 401 certifications for projects that will take place in two or more regions. The regulations governing California's issuance of 401 certifications were updated in 2000, and are contained in Sections 3830 through 3869 of Title 23 of the California Code of Regulations.

Natural Community Conservation Planning Act

The Natural Community Conservation Planning Act (NCCPA) authorizes the Natural Community Conservation Plan (NCCP) program, which is designed to promote conservation of natural communities at the ecosystem scale while accommodating compatible land use.

The following subsection on the CALFED Bay-Delta Program (CALFED) provides additional discussion regarding the NCCP prepared for that program. The East Contra Costa County HCP Association completed a Habitat Conservation Plan/Natural Community Conservation Plan (HCP/NCCP) in 2007. The HCP/NCCP took effect in January 2008. The HCP/NCCP covers terrestrial areas that may be affected by the project alternatives but does not include the aquatic resources inhabiting the Bay-Delta estuary. The East County HCP/NCCP is discussed in greater detail in Section 4.6.

CALFED

The CALFED Program, described in Chapter 2, includes an objective to conserve important biological resources that occur in the Bay-Delta estuary and elsewhere within the Central Valley rivers and tributaries. The CALFED Program includes proposals to protect, restore, and enhance many habitats, particularly in the Delta, that have experienced a loss of ecological function due to human-caused activities.

To comply with FESA, CESA, and NCCPA, CALFED prepared a program level Multi-Species Conservation Strategy (MSCS). USFWS and NMFS issued programmatic BOs for the CALFED Program based on the MSCS. CDFG approved the MSCS as in compliance with the NCCPA for certain species including most of the fish species addressed in this document.

The programmatic BOs and NCCPA compliance finding do not provide take authorization. Instead, entities implementing CALFED actions may seek take authorization through an Action Specific Implementation Plan that would be tiered from the MSCS and submitted to USFWS, NMFS, and CDFG as the basis for project-specific BO and NCCPA determination. The Action Specific Implementation Plans would be based on the MSCS, including specifically the conservation measures identified in the MSCS. An action-specific implementation plan (ASIP) will be prepared for the Los Vaqueros Reservoir Expansion Project should one of the project alternatives be approved for implementation.

Existing Los Vaqueros Reservoir

Contra Costa Water District's (CCWD's) operations of the existing Los Vaqueros Reservoir are governed in part by the following three biological documents:

(a) 1993 NMFS BO for winter-run chinook salmon

(b) 1993 USFWS BO for delta smelt

(c) 1994 Memorandum of Understanding between CDFG and CCWD regarding the existing Los Vaqueros Reservoir

These are described in Chapter 2 and Section 4.2.

Environmental Setting

The following discussion primarily addresses the fisheries and aquatic resources of the Delta, where construction- and operations-related impacts on special-status fish species and their habitat could result from the project alternatives. In the case of anadromous (migratory) species, freshwater fishery and habitat conditions upstream of the Delta are included to provide context to the discussion.

In addition to the Delta, aquatic habitat is present within the project area in the form of seasonal freshwater drainages, such as Kellogg Creek, Brushy Creek, and several unnamed drainages. Due to the seasonal nature of these streams, as well as the absence of special-status fish species or critical habitat designations for fish, no project-related impacts on fishery resources would occur in these drainages; thus, these drainages are not further discussed in this section. In addition, Los Vaqueros Reservoir does not support any special-status fish species or designated critical habitat. The reservoir does, however, support a recreational fishery. Potential impacts to the recreational fishery of Los Vaqueros Reservoir are discussed in Section 4.15, Recreation.

Regional Setting

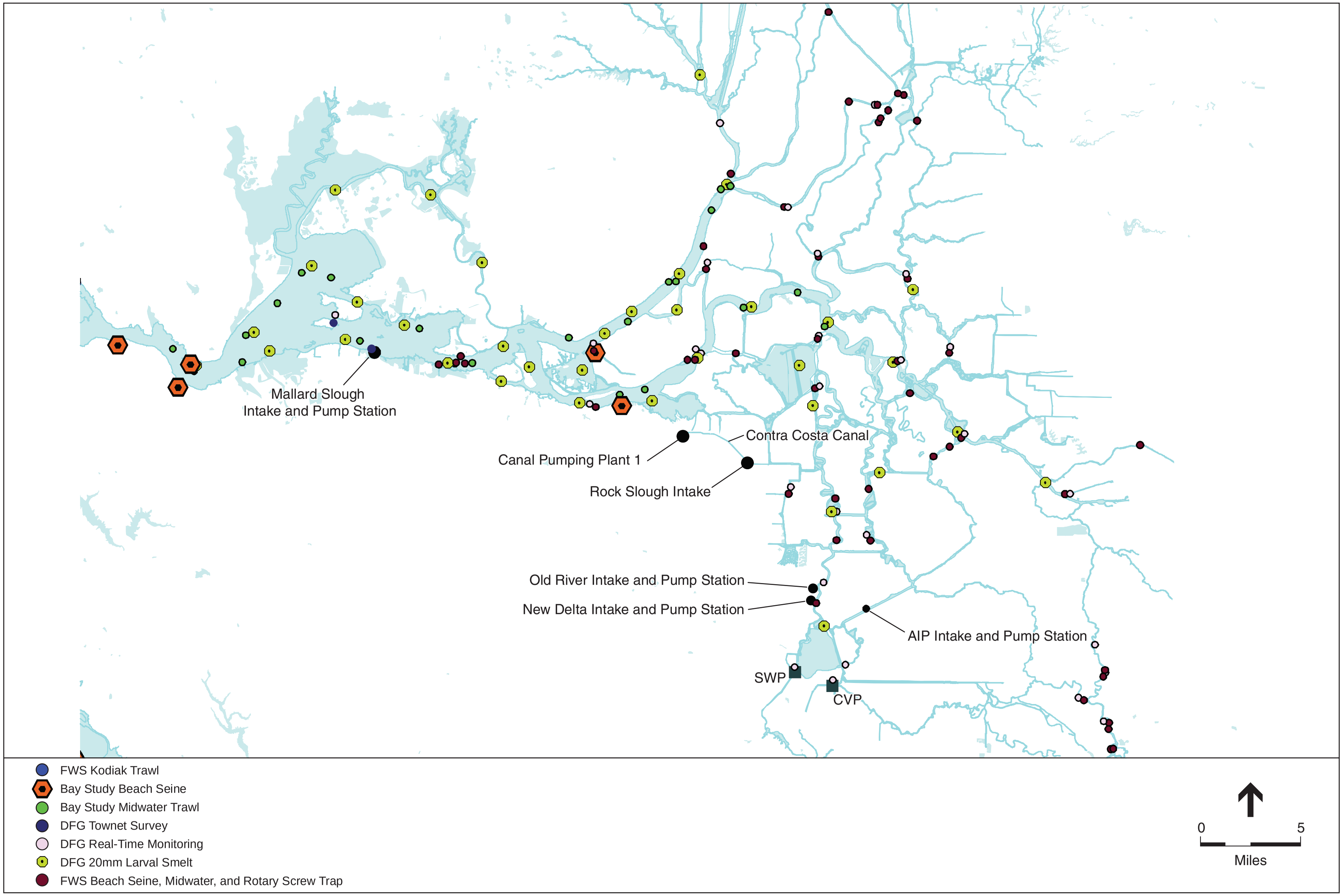
Both the existing and new water intake structures would be in the south Delta vicinity of Old and Middle rivers, which provides shallow open-water and emergent marsh habitat for a variety of resident and migratory fish and macroinvertebrates. The primarily open-water habitat within the Delta is relatively shallow (typically less than 20 feet deep) and has a relatively uniform channel bottom composed of silt, sand, peat, and decomposing organic matter. Tules (*Scirpus* spp.) and other emergent and submerged aquatic vegetation occur both within the open-water areas and along the shoreline margins of sloughs and channels, providing habitat for fish migration, spawning, juvenile rearing, and adult holding and foraging.

Waters within the south Delta are characterized by low salinity levels under most environmental conditions; however, saltwater intrusion upstream into the central and south Delta does occur under low outflow conditions. Although much of the Delta provides shallow open-water aquatic habitat, the channels within the south Delta vary in size and hydraulic complexity. Levees surrounding the sloughs and channels within the south Delta have been stabilized by riprap and other materials placed along the channel margins. These levees are typically vegetated by native and non-native grasses and shrubs. Mature riparian trees are not abundant along south Delta levees.

The water quality and hydrodynamic conditions that affect fishery habitat within the south Delta are influenced by a variety of factors, including the magnitude of seasonal freshwater inflow to the Bay-Delta estuary from the Sacramento and San Joaquin rivers and east-side tributaries, tidal circulation patterns within the south Delta, salinity, and seasonal variation in water temperature. Turbidity and suspended sediment concentrations within the south Delta are influenced by wind- and wave-induced turbulence and river flows. Specifically, large open-water surface areas such as Mildred Island and Franks Tract promote wind-generated waves, which can in turn resuspend sediments within these shallow open waters.

Sampling for fish populations has been conducted throughout the Delta, including at sampling locations within the project area. These locations are shown in **Figure 4.3-1**. Results of fishery sampling within the Bay-Delta estuary have shown that 55 fish species inhabit the estuary (Baxter et al., 1999), of which about half are non-native introduced species. Many of these non-native species, such as striped bass (*Morone saxatilis*) and American shad (*Alosa sapidissima*), were purposefully introduced to provide recreational and commercial fishing opportunities. Other non-native fish species, such as threadfin shad (*Dorosoma petenense*) and inland silversides (*Menidia beryllina*), were accidentally introduced into the estuary through the movement of water among connecting waterways; a number of other fish species, including yellowfin (*Acanthogobius flavimanus*) and chameleon gobies (*Tridentiger trigonocephalus*), were introduced through ballast water discharges from commercial cargo transports traveling primarily from Asia and the Orient.

In addition, an estimated 100 macroinvertebrate species have been introduced into the estuary, primarily through ballast water discharges (Carlton, 1979). Many non-native aquatic plants have also become established within the estuary. The purposeful and unintentional introductions of non-native fish, macroinvertebrates, and aquatic plants have contributed to a substantial change in the species composition, trophic dynamics, and competitive interactions affecting the population dynamics of native Delta species. Many of these introduced fish and macroinvertebrates inhabit the central and south Delta.



SOURCE: Hanson Environmental, 2006; DWR, 2006; DFG, 2006; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.3-1
Major Delta Fish Sampling Survey Locations within the Delta

Pelagic Organism Decline

Pelagic organisms are organisms that inhabit the open water portion of a water body such as the ocean or the Bay-Delta estuary. The Interagency Ecological Program (IEP), a consortium of nine state and federal agencies, has been monitoring fish populations in the San Francisco Estuary for decades.

One of the most widely-used IEP databases is fish catch from the Fall Midwater Trawl (FMWT) Survey, which has been regularly conducted by CDFG since 1967. This survey samples the pelagic fish assemblage in the upper estuary from the Delta to San Pablo Bay. Two of the resident pelagic fishes captured are native species, delta smelt (*Hypomesus transpacificus*) and longfin smelt (*Spirinchus thaleichthys*). Two of the most abundant introduced species are striped bass and threadfin shad.

Annual abundance of these populations is extremely variable and much of this variability is associated with hydrology (Sommer et al., 2007). Historically, the lowest abundance levels for the pelagic fishes typically have occurred in dry years, such as a 6-year drought from 1987 to 1992. Between 1995 and 2000, a wet period, abundance indices of most pelagic species increased markedly. Results of analyses have shown that many of the estuarine fish and macroinvertebrates have higher juvenile abundance in wet years when Delta outflows are relatively high, however in recent years the response of these species to hydrologic conditions has been lower than in the past, which has been hypothesized to reflect the effects of introduced non-native species (e.g., the Asian overbite clam Corbula) on the aquatic ecosystem inhabiting the estuary. By 2000, FMWT abundance indices for these four pelagic fishes (delta and longfin smelt, striped bass, threadfin shad) began to decline and continued to do so over the next several years. Abundance indices for the period between 2002 and 2008 included record lows for delta smelt and young-of-the-year striped bass, and near record lows for longfin smelt and threadfin shad (Sommer et al., 2007). By 2004, these declines became widely recognized and discussed as a serious issue, and collectively became known as the Pelagic Organism Decline (POD).

Project Area

Under Alternatives 1 and 2, the new Delta Intake and Pump Station would be constructed on Old River south of CCWD's existing Old River Intake. For the purposes of the impacts analysis concerning in-water construction activities for the new Delta Intake, the project area is considered to be within Old River, extending about 1,000 feet upstream and downstream of the construction site, as this is the estimated distance over which construction-related effects such as increased turbidity and underwater noise may extend. Alternatives 3 and 4 do not include any in-water construction activities at Delta intakes.

Potential operational effects of the Los Vaqueros Reservoir Expansion Project, such as entrainment of larval fish and other aquatic resources, may also occur within this project area. For the purposes of analyzing potential operational effects, the project area also includes any other portions of the Delta where hydraulic or hydrodynamic conditions affecting aquatic habitat may be changed such that there could be project-related indirect effects on fish or other aquatic organisms.

The new Delta Intake would be on Old River within an area of the estuary influenced by freshwater inflow from the Sacramento and San Joaquin River systems, CVP and SWP export operations, and tidal effects from coastal marine waters and the San Francisco Bay. As described in Chapter 2, CCWD currently operates a water intake with positive barrier fish screen on Old River that has been designed and is operated in compliance with the CDFG, NMFS and USFWS criteria (e.g., screen mesh size, approach velocity of 0.2 feet per second (fps), screen cleaning) that has been shown through extensive fishery monitoring to be effective in reducing and avoiding entrainment and impingement of Delta fish species. CCWD is currently constructing a similar intake structure on Victoria Canal (Alternative Intake Project – AIP), which is in the south Delta, that has also been designed to meet the screen design criteria for delta smelt and other fish species.

The new Delta Intake structure on Old River would also be designed and operated in accordance with CDFG, NMFS and USFWS criteria to protect delta smelt, juvenile salmon, and other fish species within the Delta. Old River, in the vicinity of the intake sites, is characterized by shallow water depths ranging from about 15 to 20 feet deep (measured at low slack tide) within 20 feet of the shoreline. Substrate on the channel bottom is characterized by silt and fine- and coarse-grained sand. The channel banks consist of a combination of natural earthen berm and armored riprap. Vegetation is characterized by intermittent stands of tules and submerged aquatic vegetation along the shoreline margins, grass and weedy vegetation along the channel banks, and sparse riparian (shrubs and trees) vegetation along the channel margins.

Table 4.3-1 identifies resident and migratory fish species that are known to occur in the Delta and may potentially be affected by the construction and operation of the project alternatives.

Special-Status Fish Species

Fish species identified for protection under the CESA and/or FESA that are known to occur in the Delta and may potentially be affected by the construction and operation of the project alternatives include green sturgeon, delta smelt, longfin smelt, winter-run chinook salmon, spring-run chinook salmon, and Central Valley steelhead. USFWS and NMFS have designated all or part of the Delta as critical habitat for delta smelt, Central Valley steelhead, and winter-run and spring-run chinook salmon. Therefore, this section provides additional information specifically focusing on these sensitive and protected species and their habitat. Other special-status species, including Sacramento splittail, river lamprey, and hardhead are also discussed. **Table 4.3-2** lists the special-status fish species that may potentially be affected by the construction or operation of the project alternatives.

The following is a brief discussion of the listing status, life history, and factors affecting population abundance for the special-status fish species that seasonally inhabit the Delta and may be affected by construction or operation of the project alternatives.

TABLE 4.3-1
FISH SPECIES INHABITING THE DELTA POTENTIALLY AFFECTED BY CONSTRUCTION OR OPERATION OF THE PROJECT ALTERNATIVES

Common Name	Scientific Name
Pacific lamprey *	*Lampetra tridentate*
River lamprey *	*Lampetra ayersi*
White sturgeon *	*Acipenser transmontanus*
Green sturgeon *	*Acipenser medirostris*
American shad	*Alosa sapidissima*
Threadfin shad	*Dorosoma petenense*
Central Valley steelhead *	*Oncorhynchus mykiss*
chinook salmon (winter, spring, fall, and late-fall runs) *	*Oncorhynchus tshawytscha*
Longfin smelt *	*Spirinchus thaleichthys*
Delta smelt *	*Hypomesus transpacificus*
Wakasagi	*Hypomesus nipponensis*
Northern anchovy*	*Engraulis mordax*
Starry flounder*	*Platichthys stellatus*
Hitch *	*Lavinia exilicauda*
Sacramento blackfish *	*Orthodon microlepidotus*
Sacramento splittail *	*Pogonichthys macrolepidotus*
Sacramento pikeminnow *	*Ptychocheilus grandis*
Fathead minnow	*Pimephales promelas*
Golden shiner	*Notemigonus crysoleucas*
Common carp	*Cyprinus carpio*
Goldfish	*Carassius auratus*
Sacramento sucker *	*Catostomus occidentalis*
Black bullhead	*Ameiurus melas*
Brown bullhead	*Ameiurus nebulosus*
Yellow bullhead	*Ameiurus natalis*
White catfish	*Ameiurus catus*
Channel catfish	*Ictalurus punctatus*
Western mosquitofish	*Gambusia affinis*
Rainwater killfish	*Lucania parva*
Striped bass	*Morone saxatilis*
Inland silverside	*Menidia beryllina*
Bluegill	*Lepomis macrochirus*
Redear sunfish	*Lepomis microlophus*
Green sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
White crappie	*Pomoxis annularis*
Black crappie	*Pomoxis nigromaculatus*
Largemouth bass	*Micorpterus salmoides*
Smallmouth bass	*Micropterus dolomieu*
Tule perch *	*Hysterocarpus traski*
Threespine stickleback *	*Gasterosteus aculeatus*
Yellowfin goby	*Acanthogobius flavimanus*
Shimofuri goby	*Tridentiger bifasciatus*
Shokihaze goby	*Tridentiger barbulatus*
Staghorn sculpin	*Leptocottus armatus*
Prickly sculpin *	*Cottus asper*

* Indicates native species.

SOURCE: CCWD and Reclamation, 2006.

TABLE 4.3-2
SPECIAL-STATUS FISH SPECIES INHABITING THE DELTA POTENTIALLY AFFECTED BY CONSTRUCTION OR OPERATION OF THE PROJECT ALTERNATIVES

	Listing Status[a]		
Species	Federal	State	Designated Habitat
Sacramento River winter-run chinook salmon	FE	CE	Critical Habitat
Central Valley spring-run chinook salmon	FT	CT	Critical Habitat
Central Valley fall/late fall-run chinook salmon	FSC	CSC	Essential Fish Habitat
Central Valley steelhead	FT	–	Critical Habitat
Delta smelt[b]	FT	CT	Critical Habitat
North American green sturgeon	FT	CSC	–
Longfin smelt[c]	Candidate Species	Candidate Species	–
Sacramento splittail	–	CSC	–
River lamprey	–	CSC	–
Hardhead	–	CSC	–
Pacific smelt	Candidate Species	CSC	–
Northern anchovy	–	–	Essential Fish Habitat
Pacific sardine	–	–	Essential Fish Habitat
Starry flounder	–	–	Essential Fish Habitat

[a] FE = Federal Endangered
FT = Federal Threatened
FSC = Federal Species of Concern
CE = California Endangered
CT = California Threatened
CSC = California Species of Special Concern
[b] Delta smelt are currently being evaluated as a candidate under CESA for uplisting to endangered status
[c] Longfin smelt are currently being evaluated as a candidate species for listing under CESA and FESA

Chinook Salmon

Chinook salmon are an anadromous species, spawning in freshwater and spending a portion of their life cycle within the Pacific Ocean. The species is divided into the following four runs according to spawning migration timing and reproductive behavioral differences: winter run, spring run, fall run, and late fall run. Chinook salmon generally require cool, clean, and well-oxygenated water in streams and rivers that contain adequately sized spawning gravels, instream cover, and riparian shading. Migration barriers in the form of dams, grade control structures, culverts, or water diversion structures significantly limit chinook salmon access to historical habitat throughout their range. Chinook salmon do not spawn within the Delta in the vicinity of the project area. However, this species seasonally uses the south Delta, including Old River, during adult upstream migration, smolt emigration, and juvenile rearing (Moyle, 2002). The Delta historically served as an important rearing habitat for juvenile chinook salmon. The Delta was characterized by extensive shallow-water habitats with dendritic channels and emergent wetland vegetation such as tules.

Levee construction and reclamation of wetland areas within the Delta for agriculture and other purposes has significantly modified much of the Delta, reducing the areal extent of wetlands and increasing the channelization of tributary rivers and Delta islands. Changes in hydrologic conditions resulting from the construction of upstream water storage impoundments and operations for flood control, in combination with increased levels of water diversions both upstream and within the Delta, contributed to reduced habitat quality and availability for juvenile salmon rearing within the Delta. In addition, the introduction of a number of non-native fish (e.g., striped bass, largemouth bass) increased predation mortality for juvenile salmon rearing and migrating through the Delta.

Life Histories of Winter-, Spring-, Fall-, and Late Fall-Run Chinook Salmon

The general seasonal timing of migration and spawning by each of the runs is detailed in **Table 4.3-3**.

TABLE 4.3-3
SEASONAL TIMING OF CHINOOK SALMON MIGRATION THROUGH THE SACRAMENTO-SAN JOAQUIN DELTA

	Sacramento River				San Joaquin River
Life stage	**Fall Run**	**Late Fall Run**	**Winter Run**	**Spring Run**	**Fall Run**
Adult upstream migration	July - December	November-May	Late November - June	March-July	September - December
Juvenile Rearing and Emigration	January – July (fry/smolts) October - December (yearlings)	December-April	November - May	October - June (young-of-the-year) mid-October - March (yearlings)	January - June

SOURCES: CCWD and Reclamation 2006.

Winter-run Chinook Salmon

Winter-run chinook salmon spend 1 to 3 years in the ocean before migrating upstream into the Sacramento River to spawn upstream of Red Bluff. Adult winter-run chinook salmon migrate upstream through San Francisco Bay, Suisun Bay, and the Delta during winter and early spring, with peak migration occurring during March (Moyle, 2002). Spawning occurs from mid-April through August (Moyle, 2002). Egg incubation continues through the fall. Juvenile winter-run chinook salmon rear within the Sacramento River throughout the year, and smolts migrate downstream through the lower reaches of the Sacramento River, Delta, Suisun Bay, and San Francisco Bay during winter and early spring (November through May) (USFWS, 2001).

Cold-water releases from the upstream Shasta and Keswick reservoirs are important in maintaining the quality and availability of suitable habitat in the mainstem Sacramento River for adult holding before spawning, spawning and egg incubation, and juvenile rearing. Adult holding, spawning, and egg incubation occurs primarily in the reach of the river from Keswick Dam downstream to the Red Bluff Diversion Dam (RBDD). Instream flow releases to the mainstem river are important year-round for the various lifestages of winter run salmon. The availability and release of cold water in the mainstem river is particularly important during the late spring, summer, and early fall (winter run salmon spawn and eggs incubate between about July and October – water temperatures less than about 56°F are important for successful egg development and hatching). The Sacramento River mainstem is the primary upstream and downstream migration corridor for winter-run chinook salmon. Winter-run chinook salmon are not present in the San Joaquin River drainage.

Historical Sacramento River winter-run chinook salmon population estimates, which included males and females, were as high as near 100,000 fish in the 1960s, but declined to under 200 fish in the 1990s (Good et al,. 2005). Because of the substantial decline in abundance, the species was listed as endangered under both the FESA and CESA.

Since the 1994 low point, the number of adult winter-run salmon returning to the Sacramento River has gradually increased. Population estimates in 2003 (8,218), 2004 (7,701), and 2005 (15,730) show a recent increase in population size (CDFG GrandTab, February 2007). The 2006 run was the highest since the 1994 listing. Overall, abundance measures over the past decade suggest that the abundance is increasing (Good et al., 2005). However, escapement estimates for 2007 showed a substantial decline in escapement numbers (about 2,500 adults) based on redd counts and carcass surveys.

As with other chinook salmon stocks, NMFS is continuing to evaluate the status of the winter-run chinook salmon population and the effectiveness of various management actions implemented within the Sacramento River, Delta, and ocean to ensure improved protection and reduce mortality for winter-run salmon. The increasing trend in winter-run chinook salmon abundance over the past decade was encouraging and supported preliminary discussions regarding the potential to modify the listing status from endangered to threatened, reflecting the trend toward recovery of the species. The decline in adult winter-run salmon abundance, and the abundance of other Central Valley salmon observed in 2007, which is thought to reflect poor ocean-rearing conditions, has been identified as a significant concern, particularly given the critically dry hydrologic conditions occurring in 2008 and early 2009. NMFS is currently preparing a recovery plan for Central Valley salmonids, based in part on results of the status review that will provide additional guidance on evaluating the status of winter-run salmon and the criteria for assessing recovery of the species.

Although the majority of adult winter-run chinook salmon migrate upstream in the mainstem Sacramento River, a possibility exists (although low) that adults may migrate into the south Delta and the vicinity of both the existing and new intake structures. The occurrence of adult winter-run chinook salmon within the central and south Delta would be limited to the winter and early spring period of adult upstream migration. The majority of adult winter run salmon are thought to migrate upstream through the Delta during the period from about December to March or early April.

During their downstream migration, juveniles may enter into the central Delta via the Delta Cross Channel, Georgiana Slough, or Three Mile Slough. The migration timing of juvenile winter-run chinook salmon varies within and among years in response to a variety of factors, including increases in river flow and turbidity resulting from winter storms. Thus, potential presence of juvenile winter-run chinook salmon in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities varies by season and among years within the period from November through May.

Spring-run Central Valley Chinook Salmon

Adult spring-run salmon migrate upstream through the Delta and the Sacramento River from March through October. The adults typically migrate into upstream tributaries, such as Mill, Deer, Butte, and Clear creeks, although some adults also hold and subsequently spawn in the mainstem Sacramento River in the reach from Keswick Dam to about RBDD and in the Feather River downstream of Oroville Dam. Over the summer months, adults hold in deep cold pools within the rivers and tributaries before spawning, which occurs from September to October. Cold-water releases from the upstream Shasta and Keswick reservoirs and Oroville Dam are important in maintaining the quality and availability of suitable habitat in the mainstem Sacramento and Feather rivers for adult holding before spawning, spawning and egg incubation, and juvenile rearing.

Instream flow releases from dams to the mainstem rivers are important year-round for the various lifestages of spring run salmon. The availability and release of cold water in the mainstem rivers is particularly important during the late spring, summer, and early fall (spring run adult salmon hold in the rivers during the summer months and spawn and eggs incubate from about late August through November – water temperatures less than about 56°F are important for successful egg development and hatching).

Fry emerge from spawning areas during the late fall and winter. A portion of the fry migrate downstream soon after emerging and rear in downstream river channels, and potentially in the Delta estuary, during winter and spring months. The remainder of the fry reside in creeks and upstream tributaries/rivers and rear for about 1 year. The juvenile spring-run chinook salmon that remain in the upstream habitats migrate downstream as 1–year-old smolts, primarily during the late fall, winter, and early spring, with peak migration occurring in November (Hill and Weber, 1999).

The downstream migration of both spring-run chinook salmon fry and smolts during the late fall and winter typically coincides with increased flow and water turbidity during winter storm water runoff. Construction of major dams and reservoirs on the Sacramento and San Joaquin River systems eliminated access to the upper reaches for spawning and juvenile rearing and completely eliminated the spring-run salmon population from the San Joaquin River system. Spring-run spawning and juvenile rearing currently occur on a consistent basis only within a small fraction of their previous geographic distribution.

Although the majority of adult spring-run chinook salmon migrate upstream within the mainstem Sacramento River, a possibility exists (although low) that adults may migrate into the central and south Delta. The occurrence of adult spring-run chinook salmon within the Delta in the vicinity of both the existing and new intake structures would be limited to the late winter and spring period (primarily March-May) of adult upstream migration. Juvenile spring-run chinook salmon may migrate from the Sacramento River, including its tributaries, into the Delta during their downstream migration and also use the Delta as a foraging area and migration pathway during the winter and early spring migration period. The occurrence of juvenile spring-run chinook salmon in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities would be expected during late fall through spring (October-June), when water temperatures within the Delta would be suitable for juvenile spring-run chinook salmon migration.

Fall-run and Late Fall-run Chinook Salmon

Adult fall-run chinook salmon migrate upstream from July through December (greatest migration through the Delta occurs in September-November) and spawn in October through December (Moyle, 2002), with the greatest spawning activity typically occurring in November and early December. Fall run and late fall run chinook salmon migrate upstream and spawn in rivers tributary to the Delta including the American, Feather, mainstem Sacramento, Mokelumne, Cosumnes, Tuolumne, Stanislaus, and Merced rivers and a number of smaller watersheds.

Instream flows and the release of cold water from upstream reservoirs are two of the important factors affecting habitat quality and availability for adults, eggs, and juvenile salmon. The success of fall-run chinook salmon spawning is dependent, to a large extent, on seasonal water temperatures. Seasonal water temperatures are most critical for pre-spawning adults and incubating eggs (primarily September-October) and for juvenile rearing and downstream migration (primarily April-June). After incubating and hatching, the young salmon emerge from the spawning areas as fry. A portion of the fry population migrates downstream soon after emergence, rearing in the downstream river channels and the Delta estuary (including the area next to the Old River, Rock Slough and AIP intakes, the new Delta Intake, and the SWP and CVP south Delta export facilities) during the late winter and spring months.

The remaining portion of juvenile salmon continues to rear in the upstream systems through the spring months until they have adapted to migration into salt water (smolting), which typically takes place between April and early June. In some streams, a small proportion of the fall-run chinook salmon juveniles may rear through the summer and fall months, migrating downstream during the fall, winter, or early spring as 1-year-old smolts.

Historically, before construction of major dams and water storage impoundments on Central Valley rivers, spring-run chinook salmon were considered to be the most abundant salmon species inhabiting the Sacramento and San Joaquin river systems (Yoshiyama et al., 1998). Currently, fall-run chinook salmon is the most abundant species of Pacific salmon inhabiting the Sacramento and San Joaquin Delta and Central Valley rivers. However, the 2007 adult spawning escapement for Sacramento River failed to meet the escapement goal of 122,000 to 180,000 adults for the first time in 15 years. The count of “jacks” or immature fish that return to the rivers at age two was a record low of only 2,000. This is much lower than the long-term average of 40,000 and the previous low of 10,000 (Environmental News Service, 2008). Future abundance projections are based on the previous years’ jacks and it is estimated that 2008 will also record low numbers. In response to the low observed adult escapement in 2007 and projected low returns in 2008 the PFMC closed the coastal commercial and recreational fisheries for all chinook salmon beginning in spring 2008.

The occurrence of adult fall-run chinook salmon within the south Delta in the vicinity of both the existing and new intake structures would be limited to the fall period (primarily October through December) of adult upstream migration. Juvenile chinook salmon, particularly in the fry stage, may rear within the Delta and Suisun Bay, foraging along channel and shoreline margins and lower velocity backwater habitats. Juvenile fall-run chinook salmon would be expected to occur within the Delta, and specifically within the area of the Old River, Rock Slough, and AIP intakes, the new Delta Intake, and the SWP and CVP south Delta export facilities during late winter (fry; primarily February-March) through early spring (smolts; April-early June), when water temperatures within the Delta would be suitable for juvenile chinook salmon migration.

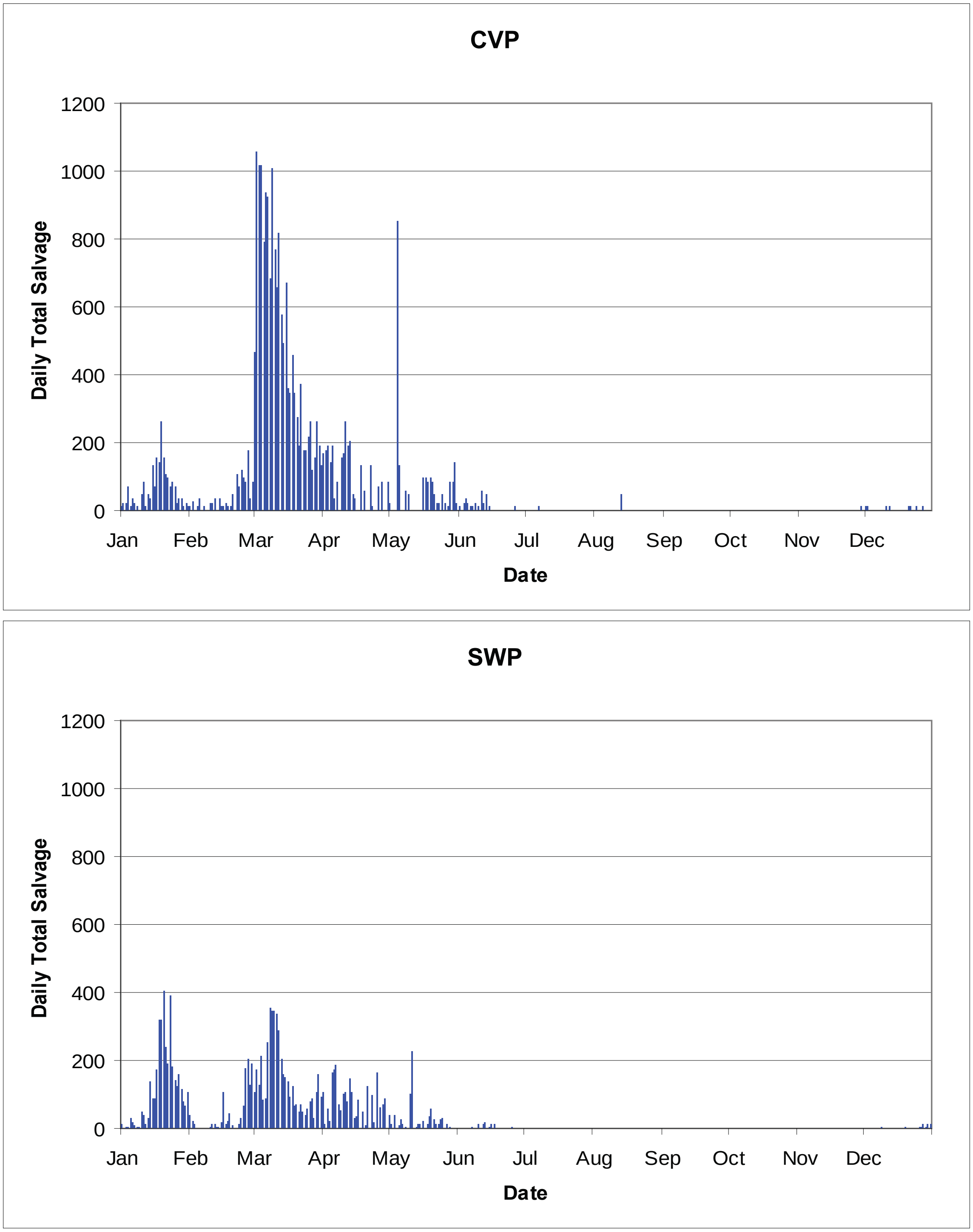
Late-fall-run chinook salmon adults migrate upstream through the Delta, in the vicinity of the existing and new CCWD intake structures and the SWP and CVP south Delta export facilities, from November through May. Late fall run chinook salmon migrate upstream, primarily into areas such as the mainstem Sacramento River between Keswick Reservoir and RBDD, and spawn from January through April. Juvenile fall-run and late-fall-run chinook salmon migrate downstream through the Delta, in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities during the late winter and spring migration period (December-April).

The seasonal occurrence of juvenile chinook salmon (all runs) observed during CVP and SWP fish salvage operations (see **Figure 4.3-2**) reflects the seasonal distribution of the species within the south Delta.

Factors Affecting Chinook Salmon Populations

The environmental and biological factors that affect the abundance, mortality, and population dynamics of chinook salmon within the Bay-Delta estuary and Central Valley include, but are not limited to the following:

- Loss of access to historical spawning and juvenile rearing habitat within the upper reaches of the Central Valley rivers caused by major dams and reservoirs that act as migration barriers
- River water temperatures affect incubating eggs, holding adults, and growth and survival of juvenile salmon
- Juveniles are vulnerable to entrainment (i.e., the pulling of fish along with current into water diversion facilities) at a large number of unscreened water diversions along the Sacramento and San Joaquin Rivers and in the Delta
- Salvage mortality (defined as the fraction of fish that do not survive fish salvage) at the SWP and CVP export facilities
- Changes in habitat quality, including availability for spawning and juvenile rearing
- Exposure to contaminants
- Predation mortality by Sacramento pike minnow, striped bass, largemouth bass, and other predators



SOURCE: DFG, 2005; Central Valley Bay-Delta Branch Fish Salvage Monitoring (http://www.delta.dfg.ca.gov/Data/Salvage/); and ESA, 2007

Figure 4.3-2
2004 Seasonal (Daily) Distribution of Juvenile Chinook Salmon in CVP and SWP Fish Salvage Operations

- Competition and interactions with hatchery-produced chinook salmon and steelhead
- Recreational and commercial fishing of subadult and adult chinook salmon
- Ocean survival is affected by climatic and oceanographic conditions
- Adults are vulnerable to predation mortality by marine mammals

In recent years, a number of changes have been made to improve the survival and habitat conditions for chinook salmon. For about the past 15 years, modifications have been made to operations at a number of Central Valley reservoirs, such as Shasta and Keswick, Folsom and Nimbus, Oroville, Camanche, and other dams and reservoirs in response to FESA protections for listed salmonids, Federal Energy Regulatory Commission permits and settlements, SWRCB water right permits, and as part of the CVP Improvement Act, for instream flow and temperature management. Modifications have been made to RBDD gate operations to increase the seasonal period when the dam gates are open to improve the migration and survival of listed salmonids and other fish.

Several large, previously unscreened water diversions on the Sacramento River, such as the Reclamation District (RD) 108 Wilkins Slough Pumping Plant, Princeton Pumping Plant, Glenn Colusa Irrigation District diversion, Sutter Mutual Water Company Tisdale Pumping Plant, and others have been equipped with positive-barrier fish screens. These screens include perforated metal plates, meshes, or other physical devices designed to prevent fish from being entrained into intake facilities while minimizing the stress and injury that can occur when fish are impinged on the screen or are subjected to changes in water velocity caused by the diversion.

Changes have been made in ocean salmon fishing regulations, particularly beginning in 2007 when the coastal ocean commercial and recreational harvest was banned in the San Francisco Bay area. Modifications to SWP and CVP export facility operations have also been made to improve the survival of juvenile chinook salmon during migration through the Delta. Modifications to SWP and CVP export operations in recent years have largely focused on reducing mortality to listed fish such as delta smelt, winter run and spring run chinook salmon, steelhead, and other fish in response to SWRCB Water Rights Decision D-1641 (D-1641), the Vernalis Adaptive Management Plan (VAMP), the CVP Improvement Act, FESA requirements of the USFWS and NMFS OCAP BOs, and federal court order.

These and other changes in management actions, in combination with favorable hydrologic and oceanographic conditions in recent years, are thought to have contributed to increasing abundance of adults returning to the upper Sacramento River since the mid-1990s. However, while chinook salmon have shown increasing abundance over the last decade, recent reports show a sharp decline in the chinook salmon population abundance in recent years. Although the causes for the decline in salmon abundance are not fully understood at this time, changes in ocean conditions are thought to be the primary reason (NMFS, 2008).

Regulatory Listing Status

The listing status of chinook salmon varies among runs. Winter-run chinook salmon are listed as an endangered species under both CESA and FESA; spring-run chinook salmon are listed as a threatened species under both CESA and FESA; and fall-run and late fall-run are not listed,[1] although both fall-run and late-fall-run chinook salmon are California species of special concern and federal species of concern. Critical habitat has been designated for winter- and spring-run chinook salmon, but neither designation includes the south Delta. Fall-run and late-fall-run are included in this environmental analysis because they support important commercial and recreational fisheries and the project alternatives would be within the area of the south Delta identified as EFH for Pacific salmon.

Central Valley Steelhead

Steelhead are the anadromous form of rainbow trout (*O. mykiss*); adults spawn in fresh water and the juveniles migrate to the Pacific Ocean, where they reside for several years before returning to the river system. Rainbow trout that spend their entire life in fresh water and do not migrate to the ocean are known as resident rainbow trout.

Life History of Central Valley Steelhead

Adult steelhead typically migrate through the Delta to upstream spawning areas during the fall and winter months (although the actual seasonal timing of adult steelhead migration may vary among years, the primary period of adult migration appears to be about November through March). A portion of the adult steelhead survive spawning and migrate back downstream (primarily in February-May) to spawn in subsequent years.

Steelhead spawn in areas characterized by clean gravels, cold water temperatures, and moderately high water velocities. Spawning typically occurs during the winter and spring (December through April), with the majority of spawning activity occurring between January and March. Although the actual geographic distribution of adult steelhead spawning is difficult to assess, adult returns occur on the American, Feather, mainstem Sacramento, Mokelumne, and Cosumnes rivers, as well as a number of smaller watersheds. Low numbers of adult steelhead may also migrate upstream into San Joaquin River tributaries. Instream flow releases and availability of cold water throughout the year from existing dams and reservoirs, in addition to access to suitable spawning and rearing habitat within tributaries, and physical habitat conditions such as spawning gravel and instream cover, have been identified as important factors affecting Central Valley steelhead.

Young steelhead rear in fresh water for 1 to 3 years before migrating to the ocean. Downstream migration of steelhead smolts typically occurs during the late winter and early spring (January through May), as reflected in the seasonal occurrence in CVP and SWP fish salvage (**Figure 4.3-3**). Although the occurrence of juvenile steelhead observed in SWP and CVP fish salvage operations

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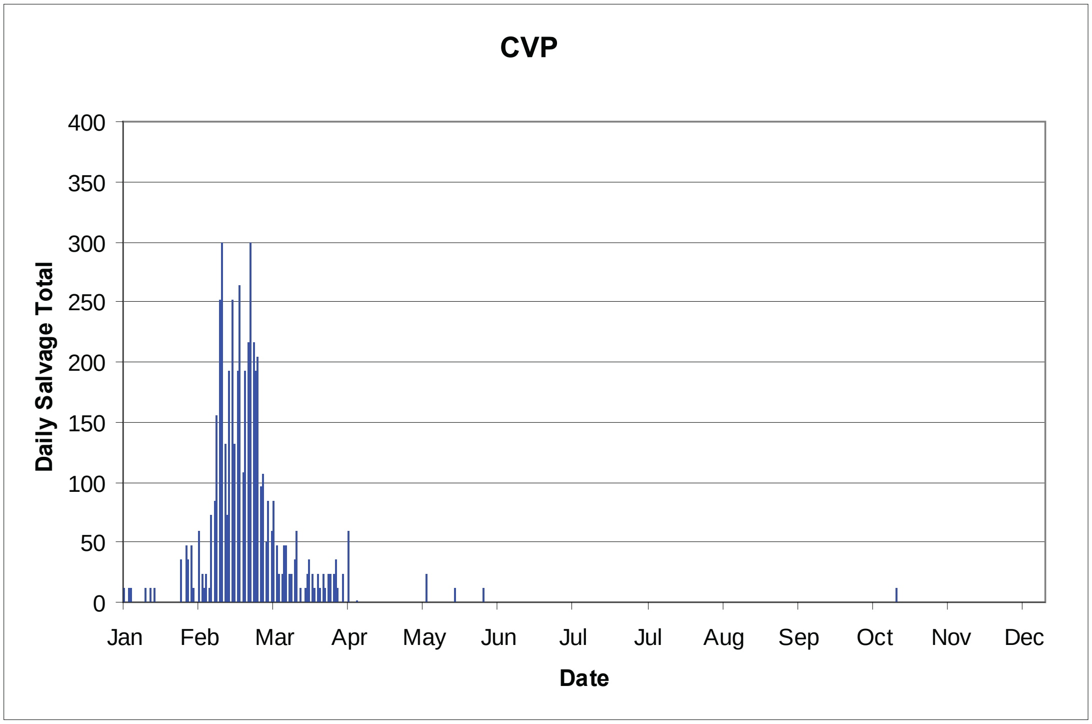
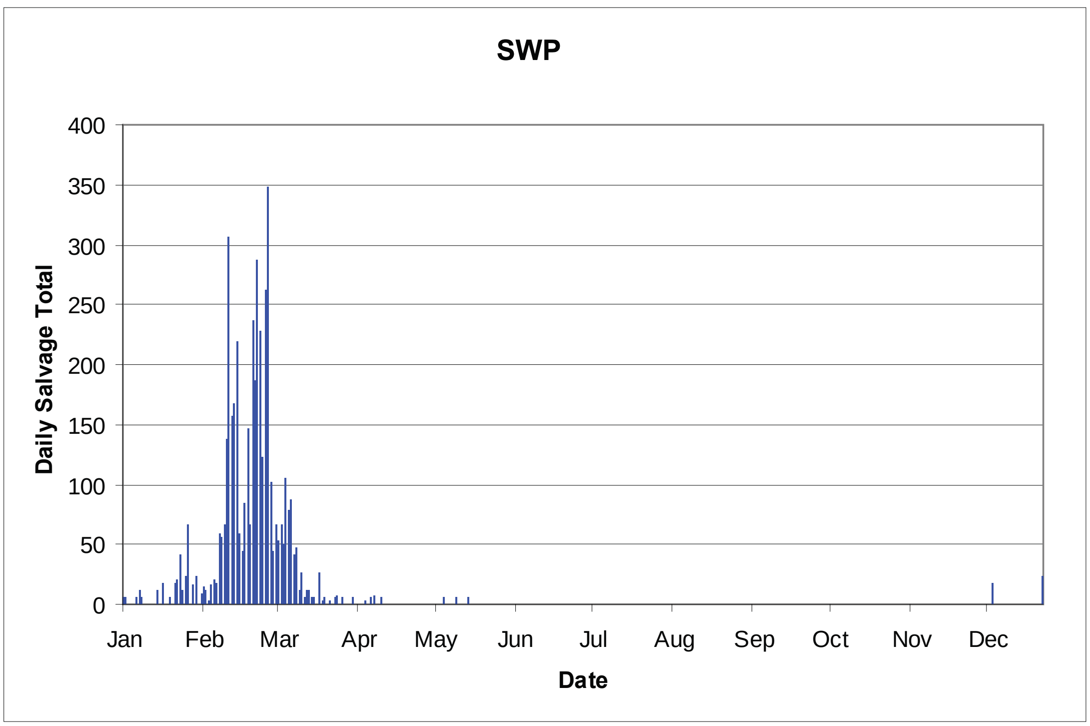
[1] In 1998, NMFS proposed that Central Valley fall-run and late-fall-run chinook salmon be listed under FESA as a threatened Evolutionarily Significant Unit (ESU) of the species. Based on further analysis and public comment, NMFS decided that fall-run and late-fall-run chinook salmon did not warrant listing, but should remain a species of concern for further analysis and evaluation.





SOURCE: DFG, 2005; Central Valley Bay-Delta Branch Fish Salvage Monitoring (http://www.delta.dfg.ca.gov/Data/Salvage/); and ESA, 2007

Figure 4.3-3
2004 Seasonal (Daily) Distribution of Juvenile Steelhead in CVP and SWP Fish Salvage Operations

may vary in response to changes in export rates, the general seasonal distribution of steelhead in the fish salvage operations is consistent with observations on the seasonal migration of juvenile steelhead observed in other fishery monitoring programs conducted within the Delta (e.g., USFWS beach seine surveys, Chipps Island trawling). The seasonal timing of juvenile steelhead occurrence in the SWP and CVP salvage (Figure 4.3-3) is considered to be representative of the seasonal period when juvenile steelhead would be present in the south Delta in the vicinity of the Old River, Rock Slough, and AIP intake structures; the new Delta Intake structure; and the SWP and CVP south Delta export facilities. The seasonal timing of downstream migration of steelhead smolts can vary in response to a variety of environmental and physiological factors, including changes in water temperature, stream flow, and increased water turbidity resulting from storm water runoff.

Historically, Central Valley steelhead migrated upstream into the upper reaches of streams and rivers for spawning and juvenile rearing. The construction of dams and other structures on Central Valley rivers created impassable barriers to upstream migration that substantially reduced access to historical spawning grounds, and reduced the overall geographic distribution of steelhead.

Although quantitative estimates of the number of adult steelhead returning to Central Valley streams are not available, anecdotal information and fish counts indicate that population abundance is low. Steelhead distribution is currently restricted to the mainstem Sacramento River downstream of Keswick Dam, the Feather River downstream of Oroville Dam, the American River downstream of Nimbus Dam, the Mokelumne River downstream of Camanche Dam, and a number of smaller tributaries to the Sacramento River system, the Delta, and San Francisco Bay.

Steelhead may also inhabit San Joaquin River tributaries in low abundance. The only consistent data available on steelhead numbers in the San Joaquin River basin come from Spring Kodiak Trawl (SKT) samples collected by CDFG on the lower San Joaquin River at Mossdale. These data indicate a decline in steelhead abundance over the past several decades. The Central Valley steelhead population is composed of both naturally spawning steelhead and steelhead produced in hatcheries.

Detailed, long-term, quantitative fishery survey information are not available on the abundance of steelhead inhabiting various Central Valley rivers as spawning and juvenile rearing habitat, or migrating through the Delta. Steelhead, unlike chinook salmon, do not necessarily die after spawning. Therefore, carcass surveys do not provide reliable information on trends in adult steelhead abundance. Adult steelhead spawn during the winter and early spring months, typically when river and stream flows are high and turbidity is high, thereby making visual observations of spawning adults and redds difficult. During rearing in the upstream tributary habitat identification of juvenile anadromous steelhead from resident rainbow trout is difficult and unreliable. In addition, juvenile steelhead migrating downstream through the Delta are typically larger than juvenile salmon, have good swimming performance capability, and have the ability to avoid capture by the conventional fishery sampling methods (e.g., seines and trawls).

The best estimates of trends in abundance of adult steelhead, therefore, come from returns to hatcheries or observations and fish counts at fish ladders such as that operated at the RBDD on the upper Sacramento River. Changes in operations of the RBDD in recent years have reduced the reliability in estimating trends in adult steelhead abundance. The information that is available from these sources (see McEwan, 2001 for a summary of information on trends in adult steelhead abundance at the RBDD) are consistent in showing a substantial decline in abundance of adult steelhead returning the Central Valley rivers each year to spawn.

Although the majority of adult steelhead migrate upstream within the mainstem Sacramento River, some adult steelhead migrate through the central Delta into the Mokelumne and Cosumnes rivers and through the south Delta into the San Joaquin River system. Therefore, adult steelhead would be present seasonally within the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities. Adult steelhead would potentially be expected to occur in the south Delta during the late fall and winter (about November through March). Juvenile steelhead migrate from the upstream spawning and rearing areas through the Delta, Suisun Bay, and San Francisco Bay, including the channels next to the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities during the winter and early spring (primarily January through May).

Steelhead do not spawn within the Delta; however, juvenile steelhead forage within the south and central Delta during emigration and hence would be present within the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities during the late winter and early spring migration period.

Factors Affecting Central Valley Steelhead Populations

Factors affecting steelhead abundance are similar to those described above for chinook salmon and include, but are not limited to:

- Loss of access to historical spawning and juvenile rearing habitat within the upper reaches of the Central Valley rivers caused by major dams and reservoirs acting as migration barriers
- Water temperatures in rivers and creeks, especially in summer and fall, affecting the growth and survival of juvenile steelhead
- Juveniles' vulnerability to entrainment at a large number of unscreened water diversions along the Sacramento and San Joaquin rivers and in the Delta
- Salvage mortality at the SWP and CVP export facilities
- Changes in habitat quality, including availability for spawning and juvenile rearing
- Exposure to contaminants
- Predation mortality by Sacramento pikeminnow, striped bass, largemouth bass, and other predators
- Passage barriers and impediments to migration
- Changes in land use practices

- Competition and interactions with hatchery-produced chinook salmon and steelhead
- Ocean survival affected by climatic and oceanographic conditions
- Adult vulnerability to predation mortality by marine mammals

Unlike chinook salmon, steelhead populations are not vulnerable to recreational and commercial fishing within the ocean, although hatchery-produced steelhead support a small inland recreational fishery.

In recent years, a number of changes have been made to improve the survival and habitat conditions for steelhead. Several large, previously unscreened water diversions on the upper Sacramento River (e.g., RD 108 Wilkins Slough Pumping Plant, Glenn Colusa Irrigation District diversion, Sutter Mutual Water Company Tisdale Pumping Plant, and others) have been equipped with positive-barrier fish screens. Modifications to fish passage facilities at locations such as the Woodbridge Irrigation District dam on the Mokelumne River, RBDD on the Sacramento River, and M&T Ranch on Butte Creek, have also been made to improve migration and access to spawning and juvenile rearing habitat. These measures have increased the ability of steelhead to migrate upstream as well as allow juveniles to migrate downstream.

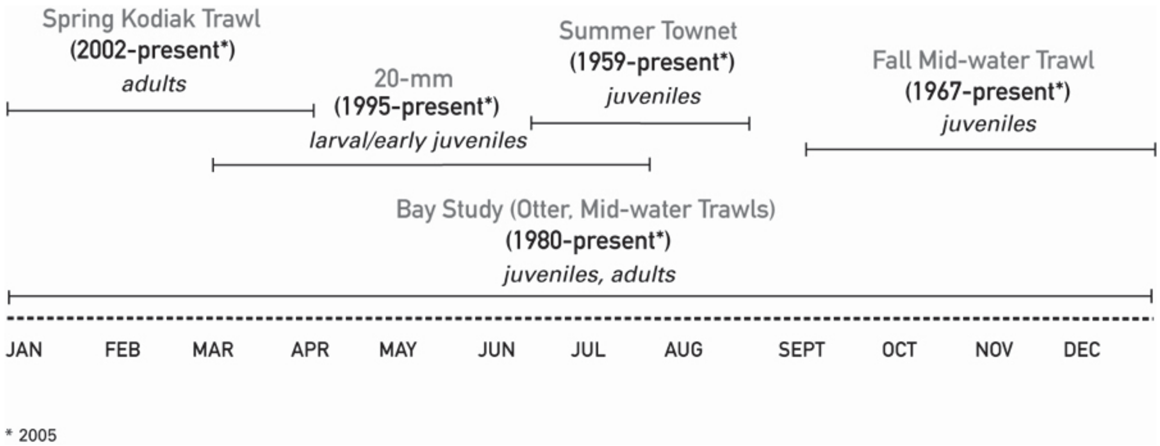
Regulatory Listing Status

Central Valley steelhead are listed as a threatened Distinct Population Segment (DPS) under FESA. Steelhead are not listed for protection under CESA. Critical habitat for Central Valley steelhead was designated in 2005 and became effective in January 2006. The critical habitat designation for this DPS includes the project area.

Delta Smelt

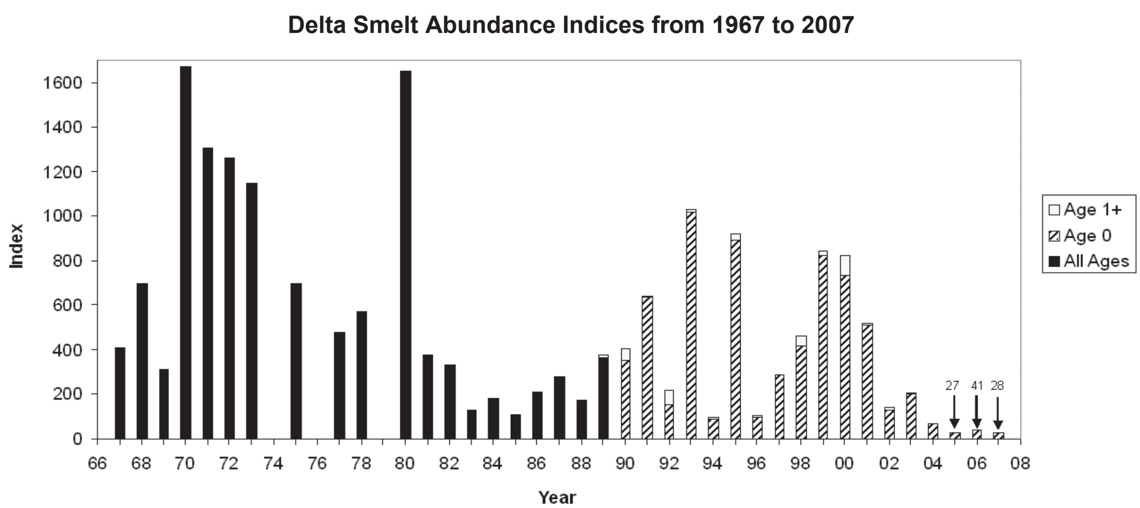
Delta smelt are endemic to the Sacramento–San Joaquin Delta estuary and inhabit the freshwater portions of the Delta, lower reaches of the Sacramento and San Joaquin rivers, and the low-salinity portions of Suisun Bay. Delta smelt experienced a general decline in population abundance over the past several decades leading to their listing as a threatened species under both FESA and CESA. Delta smelt, in addition to several other pelagic species, recently experienced a substantial decline in population abundance, otherwise known as the POD, as described earlier. The substantial declines in delta smelt abundance indices in recent years, as well as declines in other pelagic fish species, have led to widespread concern regarding the pelagic fish community of the Bay-Delta estuary. A number of recent and ongoing analyses have focused on identifying the factors potentially influencing the status and abundance of delta smelt and other pelagic fish species within the estuary. **Figure 4.3-4** indicates the timing of ongoing CDFG Delta fish surveys that collect delta smelt.

The FMWT and SKT provide indices of pre-spawning adult delta smelt abundance during late fall and winter. The 20-millimeter (mm) Delta Smelt Survey and Summer Townet Survey provide information on juvenile abundance during spring and summer. Indices of delta smelt abundance have varied substantially among years (**Figure 4.3-5**). Abundance indices were highest from 1970 to 1973, followed by a general decline in abundance extending through the



Los Vaqueros Reservoir Expansion Project . 201110

Figure 4.3-4
Time Periods of CDFG Delta Fish Surveys



SOURCE: CDFG 2008b

Los Vaqueros Reservoir Expansion Project . 201110

Figure 4.3-5
CDFG Fall Midwater Trawl Abundance Indices
for Delta Smelt, 1967–2007

mid-1980s (with the exception of 1980). Abundance was variable, but generally higher from 1991 through 2000 than it had been in the decade prior. Since 2002, abundance indices for delta smelt have been persistently low; 2004 through 2007 reflected the lowest levels on record.

The IEP continues to evaluate the available scientific information regarding the status of delta smelt and the performance of various management actions designed to improve protection, reduce mortality, and enhance habitat quality and availability for delta smelt within the estuary. Additional measures have been taken since the beginning of 2005 (e.g., 20-mm surveys, POD investigations) to assess the seasonal and geographic distribution of early lifestages of delta smelt, factors affecting population dynamics such as the magnitude of entrainment at the CVP and SWP intakes, and to monitor and provide additional information on delta smelt abundance and distribution within the Delta.

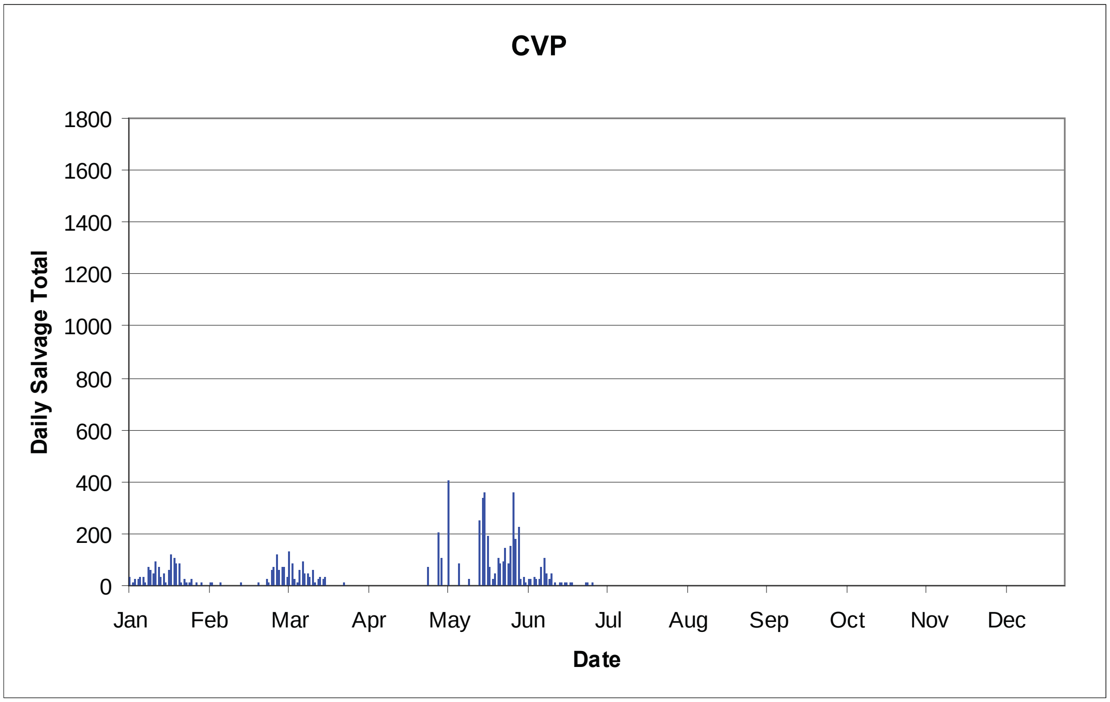
Life History of Delta Smelt

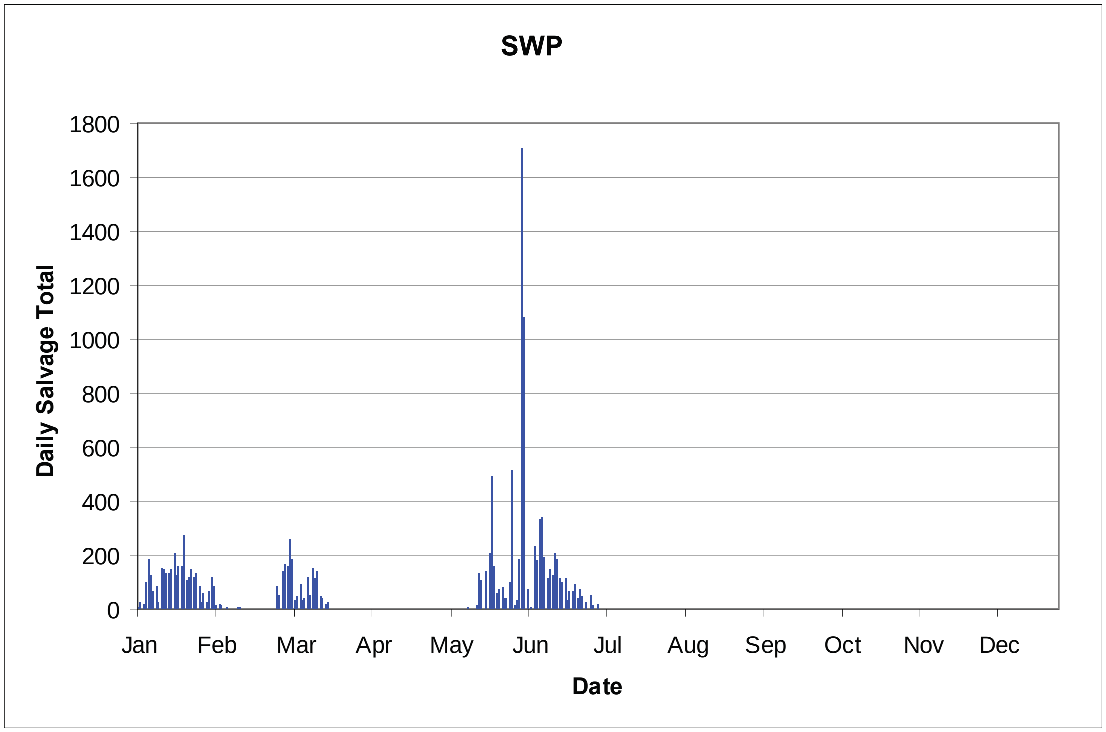
Delta smelt are a relatively small species (2 to 4 inches long) with an annual life cycle, although some individuals may live 2 years. Adult delta smelt migrate upstream into channels and sloughs of the Delta (e.g., lower Sacramento River in the vicinity of Decker Island and Rio Vista) during winter to prepare for spawning. Delta smelt live their entire life cycle within the Bay-Delta estuary. Juveniles and adults typically inhabit open waters of the Delta, including the areas in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities.

Spawning occurs between February and July; peak spawning occurs during April through mid-May (Moyle, 2002). Females deposit adhesive eggs on substrates such as gravel and sand. Eggs hatch, releasing planktonic larvae that are passively dispersed downstream by river flow. Larval and juvenile delta smelt rear within the estuary for a period of about 6 to 9 months before beginning their upstream spawning movement into freshwater areas of the lower Sacramento and San Joaquin Rivers. They also have been known to move downstream into Napa River during high flows; sometimes they do not move at all if the western end of Suisun Bay freshens; they have also been known inhabit Suisun Marsh.

Juvenile and adult delta smelt are usually most abundant within the south Delta in the vicinity of the Old River, Rock Slough and AIP intakes, the new Delta Intake, and the SWP and CVP south Delta export facilities from winter through early summer, as reflected in SWP and CVP fish salvage records (**Figure 4.3-6**). Although the occurrence of delta smelt observed in SWP and CVP fish salvage operations may vary in response to changes in export rates, the general seasonal distribution of juvenile and adult delta smelt in the fish salvage operations is consistent with observations on the seasonal migration patterns and geographic distribution of delta smelt observed in other fishery monitoring programs conducted within the Delta (e.g., 20 mm, SKT, USFWS beach seine surveys, Chipps Island trawling). The seasonal timing of delta smelt occurrence in the SWP and CVP salvage (Figure 4.3-6) is considered to be representative of the seasonal period when delta smelt would be present in the south Delta in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities.

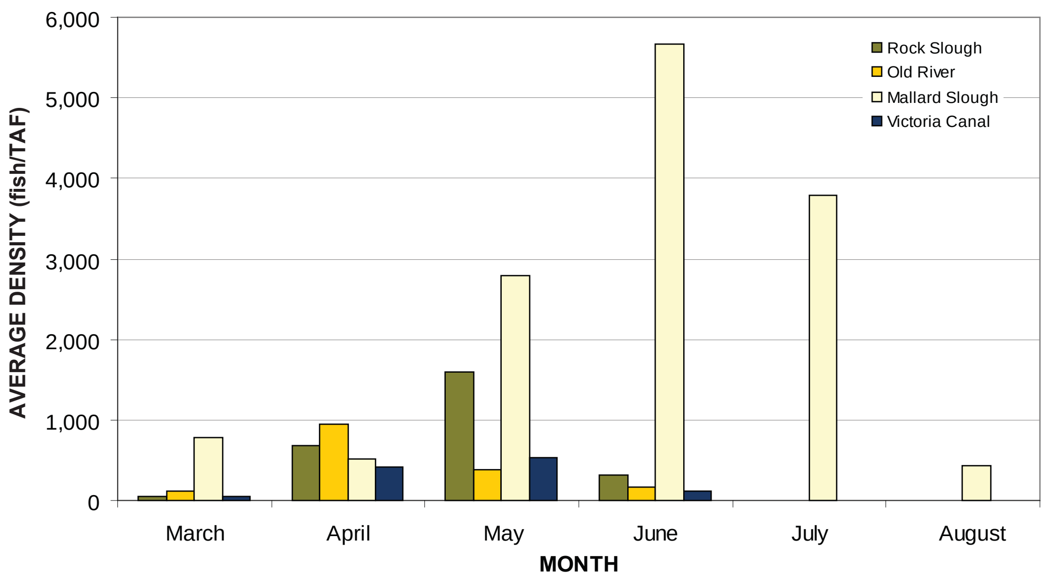
Juvenile and adult delta smelt do not typically inhabit the south Delta during summer, when water temperatures exceed about 77 degrees Fahrenheit, and high water clarity tends to keep them out during the fall (Nobriga et al., 2008; Feyrer et al., 2007). Adult delta smelt spawn within the Delta during late winter and spring, and larvae occur within the Delta during spring (**Figure 4.3-7**). As a result of their life history and geographic distribution, delta smelt may occur seasonally within the vicinity of the Old River, Rock Slough, and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities as larvae, juveniles, and adult life stages.

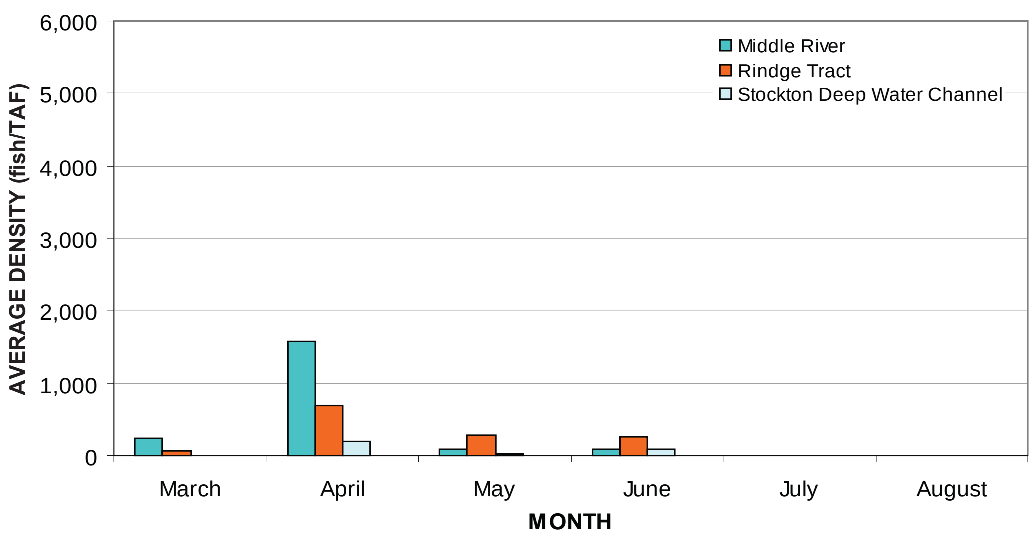




SOURCE: DFG, 2005; Central Valley Bay-Delta Branch Fish Salvage Monitoring (http://www.delta.dfg.ca.gov/Data/Salvage/); and ESA, 2007

Figure 4.3-6
2004 Seasonal (Daily) Distribution of Juvenile and Adult Delta Smelt in CVP and SWP Fish Salvage Operations





SOURCE: DFG, 2005 (http://www.delta.dfg.ca.gov/Data/20mm/); and ESA, 2007

Figure 4.3-7
1995-2005 DFG 20mm Larval Smelt Survey Average Densities in the South Delta near CCWD Intakes and the Vicinity

Modifications to SWP and CVP export facility operations have been made over the past decade to improve the survival of delta smelt and other fish species. Modifications to SWP and CVP export operations in recent years have largely focused on reducing mortality to listed fish such as delta smelt, winter run and spring run chinook salmon, steelhead, and other fish in response to SWRCB D-1641, VAMP, CVP Improvement Act, FESA requirements of the USFWS and NMFS OCAP BOs, and federal court order.

Factors Affecting Delta Smelt Populations

A variety of environmental and biological factors affect the abundance of delta smelt within the estuary (Moyle, 2002). These factors include, but are not limited to:

- Changes in the seasonal timing and magnitude of freshwater inflow to the Delta and outflow from the Delta
- Entrainment of larval, juvenile, and adult delta smelt into a large number of unscreened water diversions (primary agricultural) throughout the Delta (CBD, TBI and NRDC, 2006)
- Entrainment and salvage mortality at the CVP and SWP water export facilities
- Predation by striped bass, largemouth bass, and a number of other fish species inhabiting the estuary has also been identified as a source of mortality for delta smelt
- Exposure to toxic substances resulting in direct or indirect effects
- Variation in the quality and availability of low-salinity habitat within the Delta and Suisun Bay, in response to seasonal and interannual variability in hydrologic conditions within the Delta
- Reduced food (prey) availability thought to be the result of reduced primary production due, in part, to a reduction in seasonally-inundated wetlands, competition for food resources with non-native fish and macroinvertebrates (e.g., filter feeding by the non-native Asian overbite clam Corbula), and competition among native and non-native zooplankton species

Regulatory Listing Status

Delta smelt is listed as a threatened species under both CESA and FESA. In March 2006, a petition seeking to relist delta smelt as an endangered species was submitted to the USFWS. The proposal to elevate the listing status remains under review and USFWS has, as yet, not acted on the petition. Critical habitat for delta smelt has been designated by USFWS within the Sacramento–San Joaquin River system, including the project area.

In June 2007, the California Fish and Game Commission accepted a petition to uplist delta smelt from threatened to endangered status under CESA. This action is currently under review.

North American Green Sturgeon

Green sturgeon is a large, bottom-dwelling, anadromous fish that is widely distributed along the Pacific coast of North America. North American green sturgeon is the most broadly distributed, wide ranging, and marine-oriented species of the sturgeon family; however, they are not very abundant in comparison to white sturgeon. San Francisco Bay, San Pablo Bay, Suisun Bay, the Delta, and the Sacramento River support the southernmost reproducing population of green sturgeon.

Life History of Green Sturgeon

Habitat requirements of green sturgeon are poorly understood, but spawning and larval ecologies are probably similar to those of white sturgeon. Indirect evidence indicates that green sturgeon spawn mainly in the upper reaches of Sacramento River (e.g., Colusa to Keswick Dam). They are slow growing and late maturing, spawning every 3 to 5 years between March and July. Adult fish spawn in fresh water and then return to estuarine or marine environments. Preferred spawning habitat occurs in large rivers that contain large cobble in deep and cool pools with turbulent water (CDFG, 2002; Moyle, 2002; Adams et al., 2002). Larval and juvenile green sturgeon may rear for up to 2 years in fresh water and then migrate to an estuarine environment, primarily during summer and fall. They remain near estuaries at first, but may migrate considerable distances as they grow larger (SWRCB, 1999).

Both adult and juvenile North American green sturgeon are known to occur in the lower reaches of the San Joaquin River and in the south Delta. Juveniles have been captured in the vicinity of Santa Clara Shoals and Brannan Island State Recreation Area, and in the channels of the south Delta (NMFS, 2006). The occurrence of green sturgeon in fishery sampling and CVP/SWP fish salvage is extremely low. As a result, very little information is available on the habitat requirements, geographic distribution, or seasonal distribution of various life history stages of green sturgeon within the estuary. However, adults and juveniles have the potential to occur within the project area throughout the year.

Factors Affecting Green Sturgeon Populations

A variety of environmental and biological factors affect the abundance of green sturgeon within the estuary:

- Spawning habitat made inaccessible or altered by dams
- Destruction of riparian and stream channel habitat used for spawning
- The introduction of invasive benthic organisms such as the overbite clams and Chinese mitten crab have altered the benthic invertebrate communities
- The introduction of non-native invasive plant species such as water hyacinth and Brazilian waterweed have altered habitat by raising temperatures, reducing turbidity and dissolved oxygen, and inhibiting access to shallow water habitat (CDFG, 2002)
- Reduced rearing habitat due to historical reclamation of wetland and islands that has degraded the availability of suitable in- and off-channel rearing habitat (Sweeny et al., 2004)
- Increased water temperatures (Myrick and Cech, 2004; Allen et al., 2006a, b)

- Predation by native and non-native fish, including prickly sculpin, striped bass, and largemouth bass
- Harvest in the recreational sport fisheries and poaching (illegal harvest)

The abundance of green sturgeon is apparently reduced throughout its range. The CDFG estimated the abundance of adult green sturgeon inhabiting the Bay-Delta estuary ranged from about 500 to 1000 fish between 1967 and 1991 (EPIC, CDB, and WaterKeepers, 2001). EPIC et al. (2001) reported that the abundance of legal-size green sturgeon in 1998 was estimated to be 418 fish. While population estimates are not precise, the population is so small that a collapse could occur, but such a collapse would be difficult to detect due to the limited occurrence in conventional fishery sampling programs (SWRCB, 1999).

Regulatory Listing Status

The southern DPS of North American green sturgeon is listed as threatened under FESA and is a California species of special concern. Critical habitat for green sturgeon has not been designated.

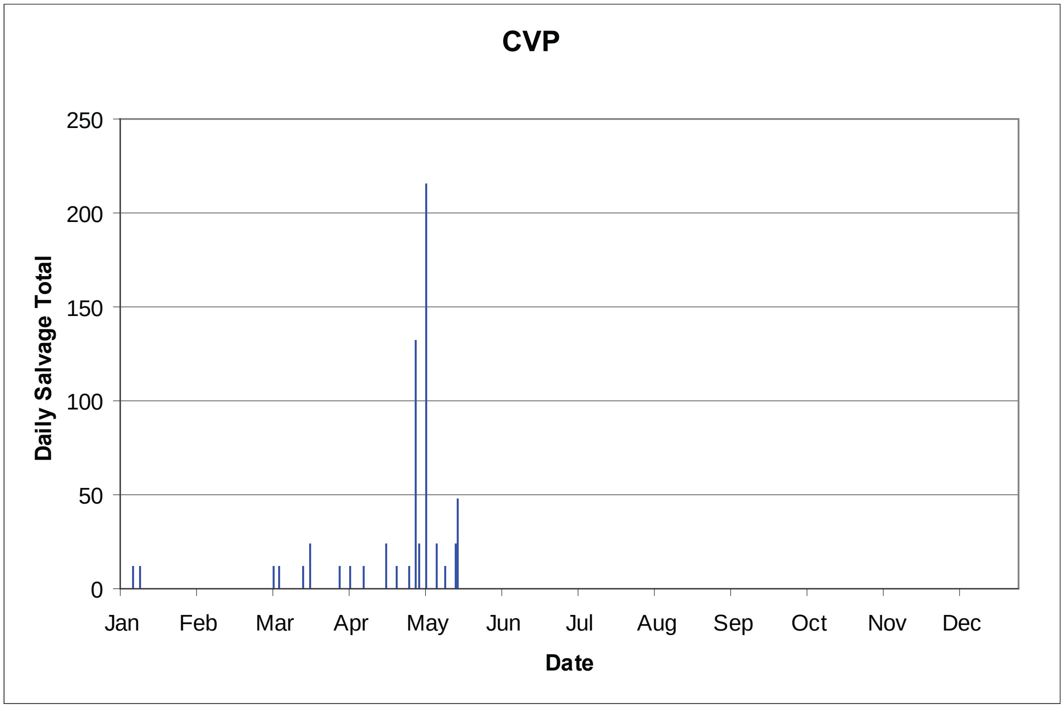
Longfin Smelt

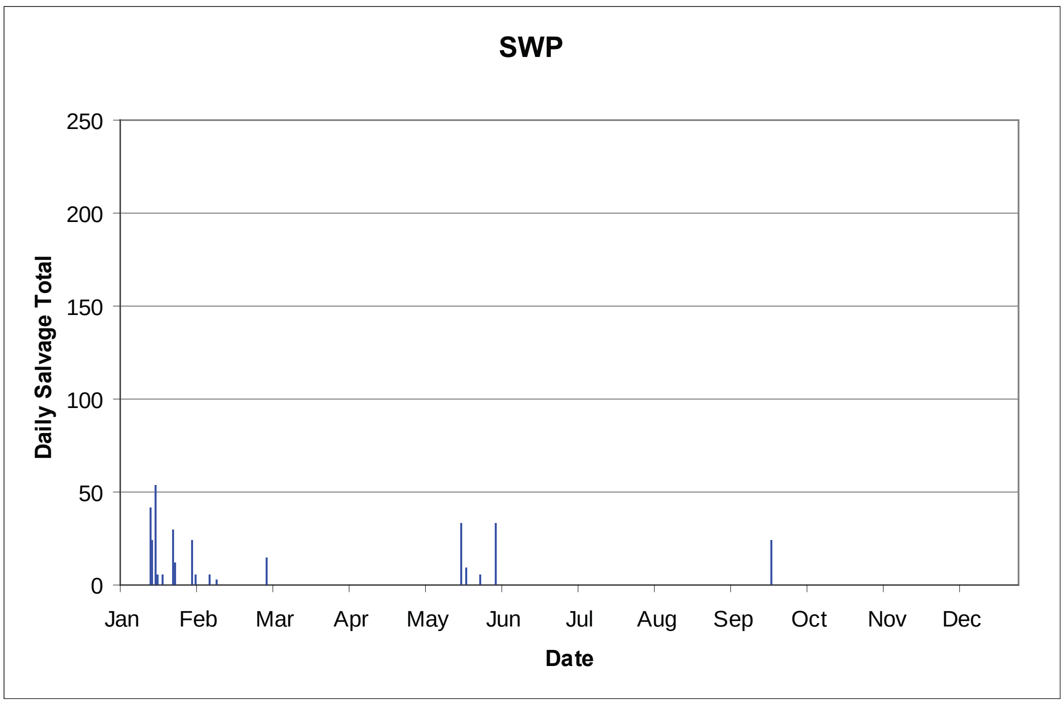
Longfin smelt is a small, planktivorous fish species found in several Pacific coast estuaries from San Francisco Bay to Prince William Sound, Alaska.

Life History of Longfin Smelt

Longfin smelt can tolerate a broad range of salinity concentrations, ranging from fresh water to seawater (TBI et al., 2007). Spawning is believed to occur in the lower reaches of the Sacramento River (downstream of Rio Vista). Spawning is also thought to occur in the eastern portion of Suisun Bay and larger sloughs within Suisun Marsh. Historically, spawning probably occurred in the lower San Joaquin Rivers (TBI, 2007). Spawning may take place as early as November and may extend into June. The majority of spawning occurs between January and March (TBI et al., 2007). Adult longfin smelt are found mainly in Suisun, San Pablo, and San Francisco Bays, although their distribution is shifted upstream into the western Delta in years of low outflow (Baxter, 1999; Moyle, 2002). The seasonal occurrence of longfin smelt in CVP and SWP salvage operations (**Figure 4.3-8**) is considered to be representative of the seasonal periods when juvenile and adult longfin smelt would be in the vicinity of the Old River, Rock Slough and AIP intake structures and the new Delta Intake structure.

Like delta smelt, longfin smelt spawn adhesive eggs in river channels of the eastern estuary, and after hatching their larvae are carried downstream (planktonic drift) to nursery areas by freshwater outflow. In contrast to delta smelt, longfin smelt juveniles and adults are broadly distributed and inhabit the more saline regions of the Bay-Delta estuary and nearshore coastal waters. During non-spawning periods longfin smelt are most often concentrated in Suisun, San Pablo, and North San Francisco Bay (Baxter, 1999; Moyle, 2002). The easternmost catch of





SOURCE: DFG, 2005; Central Valley Bay-Delta Branch Fish Salvage Monitoring (http://www.delta.dfg.ca.gov/Data/Salvage/); and ESA, 2007

Figure 4.3-8
2004 Seasonal (Daily) Distribution of Longfin Smelt in CVP and SWP Fish Salvage Operations

longfin smelt in FMWT samples has been at Medford Island in the central Delta. A measurable portion of the longfin smelt population consistently survives into a second year. During the second year of life, the adult longfin smelt inhabit San Francisco Bay and occasionally have been found in nearshore ocean surveys (Rosenfield and Baxter, 2007). Therefore, longfin smelt are often considered anadromous (SWRCB, 1999).

Factors Affecting Longfin Smelt Populations

Longfin smelt were once one of the most common fish in the Delta. Their abundance has fluctuated widely in the past, but, since 1982, abundance has declined significantly, reaching its lowest levels during drought years. Longfin abundance indices, although variable, show a general pattern of declining abundance between 1967 and 2007. Longfin smelt are among the POD species showing a substantial decline in abundance in recent years. The causes of decline are likely multiple and synergistic (Armor et al., 2006), including:

- Reduction in Delta outflows during the late winter and spring
- Entrainment losses to water diversions
- Reduced spawning and rearing habitat
- Reduced food (prey) availability thought to be the result of reduced primary production due, in part, to a reduction in seasonally-inundated wetlands, competition for food resources with non-native fish and macroinvertebrates (e.g., filter feeding by the non-native Asian overbite clam Corbula), and competition among native and non-native zooplankton species
- Climatic variation
- Exposure to toxic substances, however no known direct link exists between chemical concentration and larval mortality (Resources Agency, 2007)
- Predation, and introduced species (SWRCB, 1999)

Regulatory Listing Status

Longfin smelt is a federal species of concern and a CESA candidate species. In August 2007, USFWS was petitioned to list longfin smelt as endangered. On May 6, 2008, USFWS found that the listing may be warranted and initiated a status review to determine if listing this species is in fact warranted.

On February 7, 2008 the California Fish and Game Commission accepted a petition to list longfin smelt under CESA, thus initiating a 1-year status review period, after which the Commission will determine if listing is warranted. Under CESA, candidate species have the same level of protections against take as listed species until a final ruling is made regarding listing the species.

Given the current petitions and biological reviews of the status of the species under both FESA and CESA longfin smelt may become a federally and/or state listed species by the time any of the project alternatives is implemented.

Sacramento Splittail

Sacramento splittail is a large minnow endemic to the Bay-Delta estuary. Splittail are well adapted for living in estuarine waters with fluctuating salinity conditions. Adults and sub-adults have an unusually high tolerance for saline waters up to 18 parts per thousand, for a member of the minnow family. The species is relatively long-lived (5 to 7 years), and matures at the end of the first year (males) or third year (females). As is typical of a fish species evolved in a highly variable riverine system, juvenile abundance fluctuates annually depending on spawning success.

Life History of Sacramento Splittail

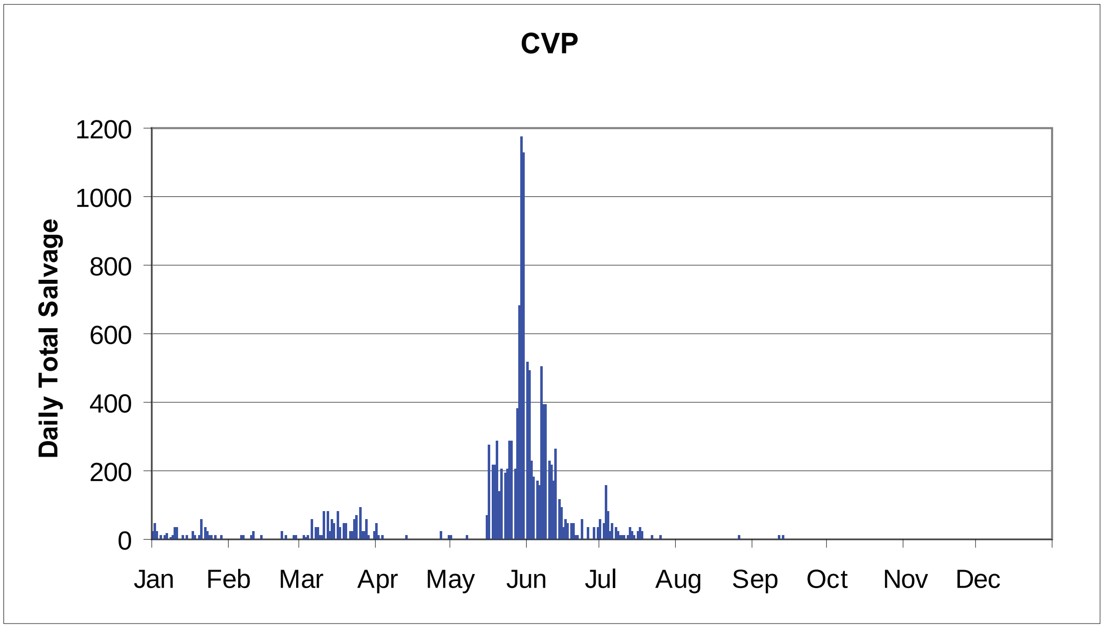
Spawning, which seems to be triggered by increasing water temperatures and day length, occurs from February through July in the Delta, upstream tributaries, Napa Marsh, Napa and Petaluma Rivers, Suisun Bay and Marsh, and the Sutter and Yolo bypasses (Baxter et al., 1996; Meng and Moyle, 1995; Sommer et al., 1997). Spawning, egg incubation, and juvenile rearing occur primarily in seasonally inundated floodplains on submerged vegetation. Juvenile splittail may occur in shallow and open waters of the Delta and Suisun Bay, but are most abundant in the northern and western Delta (Sommer et al., 2001). Adults migrate upstream to spawn during high flows that inundate floodplain spawning habitat. This habitat consists of vegetation temporarily submerged by flooding of riparian and upland habitats. The seasonal occurrence of juvenile splittail in CVP and SWP fish salvage (**Figure 4.3-9**) is representative of the periods when juvenile splittail would potentially inhabit the region of the south Delta in the vicinity of the Old River, Rock Slough and AIP intake structures and the new Delta Intake structure. Observations on the seasonal occurrence of juvenile splittail at the SWP and CVP fish salvage facilities are consistent with results of fishery surveys conducted throughout the estuary (e.g., USFWS beach seine survey).

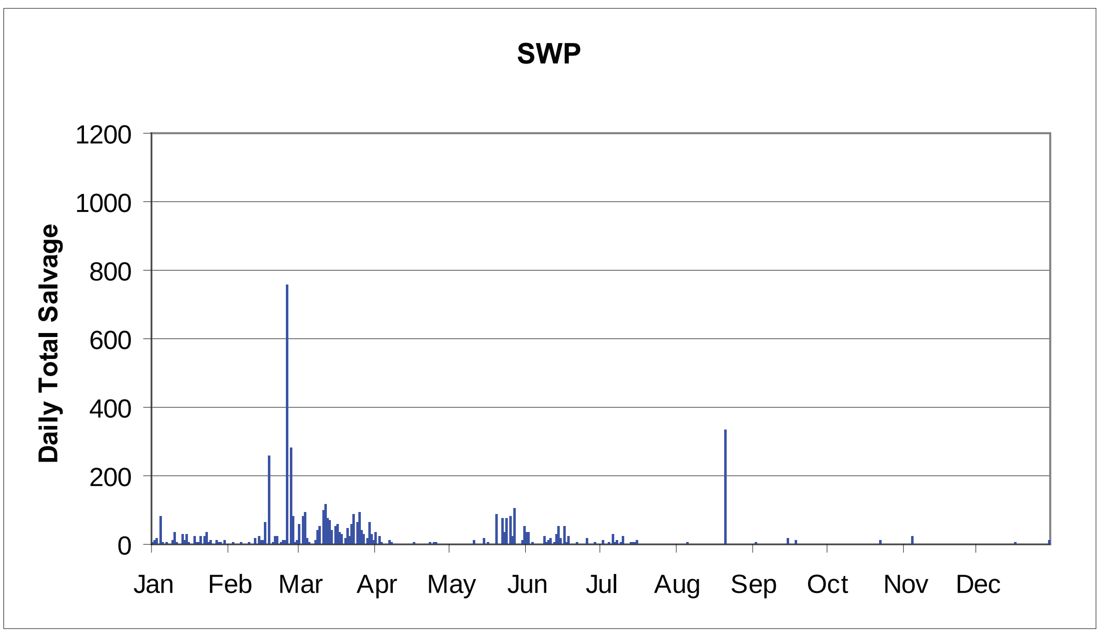
Young-of-the-year splittail abundance appears to fluctuate widely from year to year. Young splittail abundance declined substantially during the 1987 to 1992 drought (Baxter et al., 1996). In recent years, indices of juvenile splittail abundance have continued to fluctuate substantially among years (Sommer et al., 1997). In contrast to young splittail, adult abundance showed no obvious decline during the 1987 to 1992 drought (Sommer et al., 1997). The species' long lifespan and multiple year classes moderate adult population variation.

Factors Affecting Sacramento Splittail Populations

Once found throughout low-elevation lakes and rivers of the Central Valley from Redding to Fresno, this native species now occurs in the lower reaches of the Sacramento and San Joaquin Rivers and tributaries, Suisun and Napa Marshes, the Sutter and Yolo bypasses, and the tributaries of north San Pablo Bay. Environmental factors affecting splittail abundance include, but are not limited to:

- Dams, diversions, levee construction and reclamation, and agricultural development have eliminated or altered much of the lowland floodplain habitat that provides spawning and rearing habitat
- Changes in the seasonal timing and magnitude of freshwater inflow to the Delta and outflow from the Delta





SOURCE: DFG, 2005; Central Valley Bay-Delta Branch Fish Salvage Monitoring (http://www.delta.dfg.ca.gov/Data/Salvage/); and ESA, 2007

Figure 4.3-9
2004 Seasonal (Daily) Distribution of Juvenile and Subadult Splittail in CVP and SWP Fish Salvage Operations

- Entrainment of larval and juvenile splittail into a large number of unscreened water diversions (primary agricultural) throughout the Delta
- Entrainment and salvage mortality at the CVP and SWP water export facilities
- The introduction of non-native invasive plant species such as water hyacinth and Brazilian waterweed have altered habitat by raising temperatures, reducing turbidity and dissolved oxygen, and inhibiting access to shallow water habitat (CDFG, 2002)
- Predation by striped bass, largemouth bass, and a number of other fish species inhabiting the estuary has also been identified as a source of mortality for splittail
- Exposure to toxic substances resulting in direct or indirect affects
- Variation in the quality and availability of low-salinity habitat within the Delta and Suisun Bay, in response to seasonal and interannual variability in hydrologic conditions within the Delta
- Reduced food (prey) availability thought to be the result of reduced primary production due, in part, to a reduction in seasonally-inundated wetlands, competition for food resources with non-native fish and macroinvertebrates (e.g., filter feeding by the non-native Asian overbite clam Corbula), and competition among native and non-native zooplankton species
- Harvest of adult splittail by recreational anglers (SWRCB, 1999)

Regulatory Listing Status

Sacramento splittail have no federal listing status. Splittail were listed as a threatened species under the FESA in 1999 and were delisted in 2003. Splittail are designated as California species of special concern.

River Lamprey

River lamprey is an anadromous species widely distributed along the Pacific coast from Northern California to Alaska.

Life History of River lamprey

River lamprey has been captured mostly in the upper portion of the Sacramento–San Joaquin estuary and its tributaries. Adults migrate from the ocean upstream into fresh water in fall and spawn during winter or spring in small tributary streams. The lifespan of river lamprey is about 6 or 7 years (Moyle, 2002). River lamprey ammocoetes (larvae) are morphologically similar to those of the Pacific lamprey. This similarity, coupled with their overlapping seasonal and geographic distributions, makes positive identification of ammocoetes very difficult. The ammocoetes, transforming adults, and newly transformed adults have been collected in plankton nets in Suisun Bay, Montezuma Slough, and Delta sloughs (CDFG unpublished data). The presence of river lamprey in collections made above dams, such as on upper Sonoma Creek, indicates that some river lamprey may spend their entire life in fresh water.

Factors Affecting River Lamprey Populations

River lamprey has become uncommon in California, and it is likely that the populations are declining because the Sacramento, San Joaquin, and Russian Rivers and their tributaries have been severely altered by dams, diversions, pollution, land use changes, and other factors. Two tributary streams where spawning has been recorded in the past (Sonoma and Cache Creeks) are both severely altered by channelization, urbanization, and other problems (Moyle, 2002).

Regulatory Listing Status

River lamprey is a federal species of concern and a California species of special concern.

Hardhead

Hardhead is typically found in undisturbed areas of larger middle- and low-elevation streams between the Pit River in the north and Kern River in the south and is widely distributed in streams of the Sacramento–San Joaquin drainage (Moyle, 2002).

Life History of Hardhead

Hardhead is a bottom feeder that forages for benthic invertebrates and aquatic plant material as well as drifting insects and algae. Hardhead mature after their second year and presumably spawn from May through June in Central Valley streams, although the spawning season is thought to extend into August in the foothill streams of the Sacramento–San Joaquin drainage (University of California Cooperative Extension, 2003). Occurrences of hardhead in the project area are rare, with only one specimen captured between 1976 and 2005 during USFWS beach seine surveys in Old River (USFWS, 2005).

Factors Affecting Hardhead Populations

For their long-term survival, hardhead require large to medium sized, cool to warm-water streams with natural flow regimes. Because such streams are increasingly dammed and diverted—thus eliminating habitat, isolating upstream areas, or creating temperature and flow regimes unsuitable for hardhead—populations are declining or disappearing gradually throughout the species' range.

Regulatory Listing Status

Hardhead is a California species of special concern.

Pacific Smelt

Pacific smelt (*Thaleichyhys pacificus*), also commonly referred to as eulachon or candlefish, is a small (8–12 inch), planktivorous (feeding on zooplankton) fish species endemic to the northeast Pacific (northern California to Alaska). Pacific smelt are an anadromous species which spend the majority of their life in coastal marine waters but return to spawn primarily in the lower freshwater reaches of large rivers. In that portion of their range south of the US-Canadian border (Southern DPS proposed by Cowlitz Indian Tribe, 2007) the largest population spawns in the Columbia River and several of its major tributaries. Within California Pacific smelt have been reported to occur in several larger rivers including Humboldt Bay, Mad River, Redwood Creek, Russian River, and the Sacramento River (Cowlitz Indian Tribe, 2007; Moyle, 2002).

Life History of Pacific Smelt

Pacific smelt are an anadromous species within a life history similar to that of Pacific salmon. Pacific smelt spawn in freshwater near the upper extent of saltwater intrusion into a river. The smelt spawn over coarse sand or gravel substrate and typically adults die after spawning. Spawning typically occurs during the winter or early spring (December-May peaking in February-March; Moyle, 2002). Eggs are fertilized in the water column and the fertilized eggs slowly drift downstream and sink to the bottom where they adhere to the substrate. After hatching the larval smelt are planktonic drifting downstream into the estuary and nearshore coastal waters where they rear.

Pacific smelt typically spend 3 to 5 years in the marine environment (with a range from 2 to up to 9 years) before migrating upstream to spawn. Larval Pacific smelt imprint on the chemical olfactory signature of their natal river as juveniles, which allows adults to return to the natal stream to spawn.

Pacific smelt are preyed on by a variety of marine fish, birds, and marine mammals. Pacific smelt support both commercial and recreational fisheries in the Columbia River and further north. Commercial catch of Pacific smelt has declined substantially in recent years in the Columbia River basin, which is consistent with declines in other fishery surveys. Pacific smelt have not been reported in CDFG otter trawl and FMWT surveys or USFWS beach seine surveys conducted in the central or southern Delta. Other populations in California such as those inhabiting the Lower Klamath River, Mad River, and Redwood Creek have been extirpated (Cowlitz Indian Tribe, 2007).

Factors Affecting Pacific Smelt Populations

Factors that have been identified as affecting population abundance of Pacific smelt within the southern DPS described by the Cowlitz Indian Tribe (2007) include:

- Ocean rearing conditions and reduced productivity that result in reduced food availability (zooplankton abundance) associated with changes in ocean water temperatures and current patterns (e.g., El Nino events, Pacific Decadal Oscillation, upwelling)
- Climatic variation
- Modification of freshwater spawning habitat by dams, diversions, changes in hydrology, loss of gravel substrate and accumulation of fine sediments, increased water temperatures, and land use changes
- Exposure to pollutants
- Commercial and recreational harvest
- Predation mortality

Regulatory Listing Status

A petition to list Pacific smelt for protection under FESA was filed with NMFS in July 1999 to list the Columbia River smelt population. NMFS found in November 1999 that the listing petition failed to present substantial scientific information that the action was warranted. A second petition was filed with NMFS in November 2007 proposing that the population south of the Canadian border be listed as a DPS and receive protection under FESA. NMFS found that the petition was warranted and in March 2008 initiated a status review to determine whether the species or DPS warrants FESA listing. The status review is ongoing and no action has been taken on the federal listing decision. Pacific smelt is a California Species of Special Concern.

Northern Anchovy

Northern anchovy range from Cape San Lucas, Baja California to Queen Charlotte Island, British Columbia. Northern anchovy are one of the most prolific fish, in terms of numbers and biomass, along the northeastern coastal waters of the Pacific Ocean. There are three subpopulations, the northern subpopulation occurs in the estuary. This species can be the most abundant species in San Francisco Bay, constituting 85 percent of all fish. An individual anchovy can spawn two to three times a year. Post-larvae swim near the surface and are most abundant in San Francisco Bay and San Pablo Bay. As the salt wedge moves upstream within the estuary in the summer, anchovy larvae can be found in Suisun Bay and the western Delta. The juveniles use inshore bays and estuaries as their nursery ground, while adults are typically found in offshore waters. Given the typical salinity gradient in the Delta, it is highly unlikely that northern anchovy would be found in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, or the SWP and CVP south Delta export facilities.

Northern anchovy is managed under the *Coastal Pelagic Species Fishery Management Plan*. EFH for this species has been designated within the project area.

Pacific Sardine

The Pacific sardine is a schooling pelagic species distributed from northern Mexico to southeastern Alaska. Each year, beginning in their second summer, sardines migrate northwards early in summer and travel south again in fall. They form large schools (up to 10 million individuals) and are often associated with anchovy. Main spawning areas are off the coast of Southern California. Like northern anchovy, there are three stocks of Pacific sardine, of which the northern stock enters the estuary. Given the typical salinity gradient in the Delta, it is highly unlikely that Pacific sardine would be found in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, or the SWP and CVP south Delta export facilities.

Pacific sardine is managed under the *Coastal Pelagic Species Fishery Management Plan*. EFH for this species has been designated within the project area.

Starry Flounder

Starry flounder occur on the Pacific coast from Santa Barbara to Alaska. The species is found over sand, mud, and gravel bottoms in coastal ocean waters, bays, sloughs, and occasionally fresh water. Males spawn at the end of their second year and females in their third year. The spawning season extends from November through February, with the greatest activity in September-March (Moyle, 2002). Starry flounder is one of the most numerous fish in San Francisco Bay, but are relatively uncommon in the Delta. They may occur in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities.

Starry flounder is managed under the *Pacific Groundfish Fishery Management Plan*. EFH for this species has been designated within the project area.

Recreational Fisheries

The Delta supports regionally important recreational fisheries for a variety of resident and migratory fish. Recreationally important fish species harvested within the Delta include:

- **Chinook Salmon.** Fall run chinook salmon (previously described) support a recreational fishery within the Delta during the fall (October to December) when adult salmon are migrating from the ocean through the Delta into the upstream rivers to spawn. A ban on recreational fishing for chinook salmon was imposed in 2007 in response to the low numbers of returning adults.

- **Central Valley Steelhead.** Steelhead (previously described) support an inland recreational fishery for hatchery-produced steelhead within upstream rivers. No recreational fishing for steelhead occurs in the Delta.

- **Striped Bass.** Striped bass are a large anadromous non-native species introduced into the Delta in the late 1800s to support commercial and recreational fisheries. Commercial fishing for striped bass is no longer allowed; however, the species supports one of the largest recreational fisheries within the Delta. Striped bass begin spawning in the spring when the water temperature reaches 60°F, with most spawning occurring at temperatures between 61°F and 69°F, the spawning period usually extends from April to mid-June. Striped bass spawn in open fresh water, especially the Delta and lower San Joaquin River between the Antioch Bridge and the mouth of Middle River, and other channels in this vicinity. Another important spawning area is the Sacramento River between Sacramento and Princeton. About one-half to two-thirds of the eggs are spawned in the Sacramento River and the remainder are spawned in the Delta. Female striped bass usually spawn for the first time in their fourth or fifth year, when they are 21 to 25 inches long. Some males mature when they are 2 years old and only about 11 inches long. Most males are mature at age three and nearly all females at age five (CDFG, 2008a).

  Adult striped bass abundance has decreased over the past several decades, from about 1.7 million in the early 1970s to about 1 million in the late 1970s and 1980s, then to about 625,000 in 1992 (CDFG, 2008b). CDFG has hypothesized that this trend can be largely explained by the detrimental effect on young bass production of increasing water exports and decreasing freshwater flow. Distribution of adult bass, based on tag recaptures by anglers, has changed substantially. Striped bass no longer make extensive use of San Francisco Bay and instead spend a greater part of the year in the Delta and other upstream areas. Summer use of nearby ocean waters may have increased also in recent years. Total mortality of adult striped bass has increased over the past decade due to an increase in natural mortality, while angling mortality has declined. Variations in adult abundance are correlated with the combination of the 38 mm young-of-the-year index and losses to water exports after the 38 mm index is set. The 38 mm index and subsequent export losses are both dependent on export rates and outflow, so that adult abundance is affected by exports and outflow throughout the year (CDFG, 2008b).

- **White Sturgeon.** White sturgeon are a popular recreationally harvested species, with the primary fishery downstream of the Delta in Suisun and San Pablo bays. Habitat requirements of white sturgeon are not well understood, but spawning and larval ecologies are probably similar to those of green sturgeon (previously described). White sturgeon are characterized by a large body size, large head and mouth, and long cylindrical body. The white sturgeon is a slow growing, late maturing anadromous fish. White sturgeon spawn in large rivers in the spring and summer months and remain in fresh water while young. Older juveniles and adults are commonly found in rivers, estuaries, and marine environments.

  Anadromous white sturgeon most commonly move into large rivers in the early spring, and spawn in May through June. Spawning usually takes place in rivers having a swift current with a rocky bottom, near rapids. White sturgeon can spawn multiple times during their life, and apparently spawn every 4 to 11 years as they grow and mature. Females can produce from 100,000 to several million eggs each. Older white sturgeon produce more eggs with longer intervals between spawns. Adults apparently broadcast spawn in the water column and the fertilized eggs sink and attach to the bottom where egg incubation takes place. Research shows that eggs can hatch in 4 days to 2 weeks, depending on water temperature. It has been estimated that white sturgeon reach maturity in 5 to 11 years.

  Because of their life history, geographic distribution, and large size, white sturgeon have a lower vulnerability to entrainment into water diversions than many of the other fish inhabiting the Delta. Seasonal hydrology within the rivers and estuary has been identified as factor affecting habitat conditions for white sturgeon.

- **Catfish.** A variety of species of catfish inhabit the Delta and are harvested in the local recreational fisheries. These species include black, brown, yellow, white, and channel catfish. These catfish (also referred to as bullhead) were primarily introduced into the Delta during the late 1800s from eastern watershed to support local recreational fisheries (Moyle, 2002). White catfish are among the more common species and are the most important catfish species harvested by recreational anglers within the Delta (before 1953 white catfish supported a commercial fishery within the Delta; Moyle, 2002).

  Catfish typically inhabit areas characterized by lower water velocities (e.g., sluggish channels, sloughs, and backwaters) where turbidity is high and waters are relatively warm. Catfish inhabit areas of the Delta where salinity is low, because most species have a low salinity tolerance. Catfish feed on a variety of organisms including shrimp and other macroinvertebrates, clams, worms, and small fish. As a result of their life history and size, catfish are generally less vulnerable to entrainment at water diversions than many other fish. Hydrologic conditions within the Delta influence the geographic distribution of catfish, primarily through regional variation in salinity.

- **Largemouth (Black) Bass.** Over the past decade the Delta has become known as a world-class fishery for largemouth bass. Both northern and Florida strain largemouth bass have been introduced into the Delta (northern strain in the late 1800s and Florida strain in the 1960s) to support recreational fisheries. Largemouth bass typically inhabit areas of the Delta having relatively shallow water with associated emergent vegetation, submerged vegetation, or other cover and structures. Largemouth bass are abundant in habitat along major channels, sloughs, and backwaters with salinities less than about 3 parts per thousand (Moyle, 2002). Largemouth bass are a major predatory fish within the Delta. Juvenile and adult largemouth bass forage aggressively on crayfish, fish, and other organisms such as frogs. Largemouth spawn in the spring (April-June) in nests that are guarded by the adult until the fry emerge and begin feeding.

Within the Delta there has been a growing popularity for largemouth bass recreational angling tournaments. Tournaments are held year-round with prizes awarded based on weight of individual bass and total weight of up to five bass. Tournament anglers are required to maintain the bass alive, which are then released back into the Delta after completing the weigh-in. The number of bass anglers, the number of tournaments, and the size of individual bass have all been increasing in recent years. Several of the recreational tournaments held recently in the Delta have been televised nationally (e.g., Bass Masters Invitational). As a result of their life history and size, largemouth bass are generally less vulnerable to entrainment at water diversions than many other fish. Hydrologic conditions within the Delta influence the geographic distribution of catfish, primarily through regional variation in salinity.

- **Other Popular Sportfish.** The Bay-Delta estuary supports a number of other fish species that are harvested by recreational anglers. The majority of these species, such as Pacific halibut, surfperch, flounder and sole, inhabit the more saline regions of the estuary including San Pablo and San Francisco bays. As a result of the low salinities that occur year-round in the south Delta these species are rare or absent in the vicinity of the Old River, Rock Slough and AIP intake structures, the new Delta Intake structure, and the SWP and CVP south Delta export facilities.

Recreational fishing in the Delta includes shore, small-craft, and charter-boat fishing. A brief description of these fisheries is provided below.

Shore Fishing

Shore fishing is conducted throughout the Delta, including along many of the levees bordering the river channels. Shore anglers primarily target species such as striped bass, catfish, and sturgeon. Anglers fish from levees and several public and private access locations.

Small-Boat Fishing

Recreational angling from small boats (e.g., 12 to 40 feet) is common throughout the Delta. The majority of angling occurs on weekends from April through October or November. There are public boat launches and a number of marinas within the Delta in the general vicinity of Old River. Several hundred small boats may launch at the marinas in the area on a weekend day, depending on the time of year and the weather, to fish within the Delta channels. Although small-boat angling occurs throughout the year, peak months for recreational fishing are April, May, and June, when target species are striped bass, largemouth bass, and catfish. Many of the recreational anglers fishing within the central Delta participate in local bass tournaments.

Charter-Boat Fishing

As many as 50 commercial party boats operate out of the Bay-Delta ports, many of which are small six-passenger boats that operate seasonally. Many party boats are focused on salmon, rockfish, sanddab, Dungeness crab, and occasionally albacore tuna fishing outside the Golden Gate. Commercial party boats also target halibut, striped bass, and sturgeon in San Francisco Bay, Suisun Bay, and the Delta. Anglers on small charter boats fish within the central Delta, targeting species such as striped bass and sturgeon. Although party boats fish within the estuary throughout the year, the peak months for fishing are April, May, and June, when striped bass are most abundant.

4.3.2 Environmental Consequences

The impact analysis focuses on the Delta fishery and aquatic resources that could be present in the project area. Potential impacts to other project area aquatic habitats such as Kellogg Creek, Brushy Creek, and several unnamed drainages, as well as Los Vaqueros Reservoir, are covered under Section 4.5, Local Hydrology, Drainage, and Groundwater, and Section 4.6, Biological Resources. Potential impacts on recreational fishing during construction of an expanded Los Vaqueros Reservoir are discussed in Section 4.15, Recreation.

Methodology

An impact assessment of fisheries and aquatic resources was performed to evaluate the potential effects of the project alternatives. The effects were based on consideration of:

- Construction activities at the new Delta Intake site and the surrounding area expected to be disturbed
- Existing habitat conditions in the project area in the south Delta
- Known or presumed occurrence of special-status species near the Old River Intake, Rock Slough and AIP Intakes, the new Delta Intake and the SWP and CVP export facilities
- The results of hydrologic and particle tracking modeling combined with biological information such as the efficiency of positive barrier fish screens at project intakes, and the historical distribution and density of important fish species, to evaluate changes in regional habitat conditions within the Delta in response to changes in hydrodynamics and changes in fish entrainment potential associated with the project alternatives

Additional information regarding the data, assumptions, and methods used to evaluate potential effects of operational alternatives for the Los Vaqueros Reservoir Expansion project is presented in Appendix C-7.

The potential construction- and operation-related effects are discussed with regards to the Delta fishery resources as a whole. However, some species-specific effects are discussed separately where appropriate. Information on the seasonal timing of occurrence of various resident and migratory fish in the project area is also used to assess the potential for adverse impacts on various fish species.

The fish species identified as potentially occurring in the project area have different life histories, habitat requirements, and differing abilities to avoid or withstand potentially adverse conditions. Results of biological monitoring and experimental investigations have shown that certain fish species, such as delta smelt, are more sensitive than other species to changes in environmental conditions that may arise as a result of intake structure construction (e.g., exposure to suspended sediments) and operations (e.g., increased vulnerability of larvae to entrainment, changes in hydrodynamics that affect habitat conditions, etc.). Relative to delta smelt, juvenile chinook salmon have greater tolerance to suspended sediments, are more likely to be excluded due to their larger size at small-mesh screens, and are better able to avoid impingement on a fish screen due to stronger swimming performance. Other resident fish species within the project area such as striped bass, largemouth bass, and catfish also have substantially greater tolerance to changes in various conditions when compared to more sensitive species. To be most protective of the fishery, the assessment of potential for adverse impacts and the development of avoidance and mitigation measures, where necessary, has been based on information for the species determined to have the highest level of sensitivity to potential changes in conditions caused by the project.

The impact analysis presented discusses both: (1) potential short-term impacts associated with construction activities, and (2) potential long-term impacts associated with facility operations. The issues and considerations involved in evaluation of the long-term operational impacts are described in more detail below. The analysis evaluates the potential direct, indirect, and cumulative impacts on fisheries and aquatic resources resulting from implementation of the project. Cumulative impacts are embodied in the analysis of hydrologic modeling of future conditions, which assesses the overall impacts of the project alternatives in light of projected 2030 levels of demand, and planned changes or additions to water resources infrastructure (as discussed in Section 4.1), and therefore are included in analyses conducted for future conditions.

Operational Considerations for Potential Long-Term Impacts

The operational considerations for the evaluation of potential long-term impacts are changes in the seasonal timing and magnitude of water diversions from the Delta under all alternatives and the addition of a new diversion location with the new Delta Intake under Alternatives 1 and 2. These changes may affect aquatic species directly through changes in entrainment and/or impingement, or indirectly through changes in hydrologic conditions and aquatic habitat.

The evaluation of potential fishery and aquatic resource impacts due to project operations is based, in part, on the hydrologic modeling results describing water diversion operations over a range of environmental and hydrologic conditions (see Appendix C for details on the modeling methodology and results). Hydrologic modeling results provide the foundation for assessing effects of diversion operations on fish species and their habitat within the Bay-Delta estuary. The assessment relies on a comparative analysis of operational and environmental conditions within the estuary under without project conditions and with the project alternatives (including both 2005 and 2030 levels of development). Modeling output that was evaluated as part of the fisheries analysis includes:

- Water export operations at the SWP Banks Pumping Plant and CVP Jones Pumping Plant, as well as diversions at the Rock Slough Intake, Old River and AIP Intakes, and new Delta Intake
- Hydrologic conditions in the Delta, such as total Delta inflow and outflow, flows within Old and Middle Rivers, flows within the lower San Joaquin River (Qwest), and the location of the 2 parts per thousand salinity isohaline also known as X2
- The effects of hydrologic conditions and intake operations on larval and planktonic assemblages as reflected by particle tracking model (PTM) simulations

An overview of the tools used to measure the indirect and direct effects of project operations is provided in the discussion below. A more detailed presentation of the individual metrics and their biological significance is provided under the discussion of each potential impact.

Indirect Effects Assessment

Indirect effects of project operations on hydrologic and aquatic habitat conditions were examined during specific times of the year when sensitive fish species and their vulnerable life stages have been shown to be present within the Delta. Potential effects on fish populations were measured using a number of different parameters that have been shown to be, or are thought to be, significant factors that affect habitat conditions and the reproduction of various fish and macroinvertebrate species inhabiting the Bay-Delta estuary. These include habitat parameters such as the location of X2, flow factors such as net Delta outflow and net flow on the lower San Joaquin River, salinity in the interior Delta (described in Section 4.2, Delta Hydrology and Water Quality), river flows upstream of the Delta, and circulation within the Delta.

The model tools used in this assessment included the statewide operations model (CalSim II), the Delta hydrodynamic model (DSM2), and a particle tracking model (PTM). CalSim II and DSM2 are discussed in Section 4.2, Appendix C-2 and Appendix C-3. The particle tracking model is discussed in Appendix C-7. Consideration in the analysis was also given to changes in Delta habitat conditions reflecting a range of hydrologic conditions (e.g., wet or dry water years) within the Central Valley.

Additional information on the parameters used to assess indirect effects and a summary of the results is presented under Impact 4.3.6, with additional details presented in Appendix C-7.

Direct Effects Assessment

The assessment of direct effects involved a determination of changes in potential entrainment and impingement of various fish species at Delta intakes. Three analyses were performed. The analyses were complementary as each analysis alone had its own distinct assumptions and limitations. The analyses and methods are summarized below with additional details in Appendix C-7.

The first analytical method estimated fish entrainment potential by using historical field survey data for a number of fish species monitored in the vicinity of the Rock Slough Intake, Old River and AIP intakes, the new Delta Intake, and the CVP and SWP export facilities. Indices of potential fish entrainment for each month of the year were developed by multiplying the average monthly fish density near an intake (fish per acre-foot) by the volume of water diverted at each intake location for that month (acre-foot per month). Average fish densities are based on fishery monitoring conducted between 1995 and 2007, as described below and in Appendix C-7. Monthly pumping volumes are determined through CalSim II modeling for each alternative being evaluated.

The second method used the same PTM tool described under the indirect effects assessment, simulating a release of particles at various locations within the Delta that are either known to represent important fish habitat or important hydrologic locations. For the assessment of direct effects of entrainment, particles were tracked and counted when they entered Delta water intakes (e.g., the Rock Slough Intake, Old River and AIP Intakes, and new Delta Intake, the SWP or CVP export facilities, or agricultural intakes). Because the particles simulated in the model are neutrally buoyant (and therefore have no swimming behavior or other independent movement), results of these analyses are most relevant to the planktonic early larval stages of various organisms such as larval delta smelt that do not move independently in the water column. The particles are not considered to reflect the movement or entrainment of juvenile or adult fish, such as chinook salmon, steelhead, or sturgeon within the Delta. Additionally, PTM does not account for the efficiency of various fish screens. Consideration of these limitations is applied post-simulation during interpretation of the PTM results with respect to the entrainment risk for various fish species and lifestages included in the analysis.

A third method involves comparison of net flows in Old and Middle River. Limits on net flow in Old and Middle River are being used as a control mechanism in the interim order by Judge Wanger in *NRDC v. Kempthorne* to reduce the potential for entrainment of delta smelt at the CVP and SWP export facilities. Two approaches were used to evaluate effects on net flow Old and Middle rivers. One approach was to calculate the value of net Old and Middle river flows based on hydrologic and hydrodynamic modeling; this analysis is presented as part of the indirect effects assessment discussed above. The other approach uses a flow index that has been correlated to pre-spawning adult delta smelt salvage at the CVP and SWP export facilities in the southern Delta during the winter months. This method is similar to the measured value of Old and Middle River net flow; however, because this method correlates diversions at the export facilities with salvage at the export facilities, it is a direct method to examine potential entrainment.

These analytical methods were used to evaluate the benefits and impacts of the Los Vaqueros Reservoir Expansion Project on Delta fisheries under a range of project operations. Each of the methods used for evaluating fishery effects provides useful information, but each method also has limitations; the suite of methods were used together to develop a comprehensive understanding of project impacts and benefits. The analyses universally show that the project (Alternatives 1, 2 and 4) has no adverse impacts on fish, and provides a range of benefits for fish, including changing the timing of water diversions, improvement in flow conditions, temperature, or other benefits that contribute to restoration of aquatic ecosystems and native fish and wildlife. The actual level of benefits achieved would ultimately depend on the project alternative selected and its final permits, including federal and state endangered species act permits, and any other requirements under state or federal law.

Additional information on these three methods used to assess direct effects of potential entrainment is presented under Impact 4.3.7, with additional details presented in Appendix C-7.

Significance Criteria

The California Environmental Quality Act Guidelines, Section 15065, and Appendix G, the Council on Environmental Quality definition of "significant" (40 CFR 1508.27) and professional judgment indicate that the project alternatives would result in a significant impact on Delta fisheries and aquatic resources if it would do any of the following:

- Directly or indirectly reduce the growth, survival, reproductive success, or recovery of individuals of species listed or proposed for listing as threatened or endangered under CESA or FESA
- Directly or indirectly reduce the growth, survival, or reproductive success of substantial portions of candidate species populations, federal species of concern, state species of special concern, or regionally important commercial or game species
- Reduce the quality or quantity of important or unique habitat for fish species or their prey that would adversely affect the ability of the species to successfully reproduce and maintain self-sustaining populations
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state HCP.

The last criterion is not applicable here because, as discussed in Section 4.3.1, fish species are not covered in the East Contra Costa County HCP/NCCP and the CALFED Multi-Species Conservation Strategy (MSCS) and related BOs and NCCPA determination are programmatic documents that do not provide coverage for the Los Vaqueros Reservoir Expansion Project or any specific CALFED actions. Rather, the MSCS provides the basis for preparing an Action Specific Implementation Plan that could be used to comply with federal and state Endangered Species Acts and the NCCPA.

Impact Summary

Table 4.3-4 provides a summary of the impact analysis for issues related to fisheries and aquatic resources based on actions and alternatives described in Chapter 3.

TABLE 4.3-4
SUMMARY OF IMPACTS – DELTA FISHERIES AND AQUATIC RESOURCES

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.3.1: In-channel construction activities associated with the new Delta Intake structure would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Old River, which would increase exposure of various life stages and species of fish to temporarily degraded water quality conditions.	LSM	LSM	NI	NI
4.3.2: Underwater sound-pressure levels generated during cofferdam installation for the new Delta Intake could result in behavioral avoidance or migration delays for special-status fish species.	LSM	LSM	NI	NI
4.3.3: Dewatering of the cofferdam for the new Delta Intake could result in stranding of fish.	LSM	LSM	NI	NI
4.3.4: The new Delta Intake structure and associated fish screens in Old River would physically exclude fish from a small area of existing aquatic habitat and modify existing aquatic habitat.	LSM	LSM	NI	NI
4.3.5: The new Delta Intake structure and associated fish screens in Old River would modify hydraulic conditions next to the intake structure, but would not disorient special-status fish or attract predatory fish.	LS	LS	NI	NI
4.3.6: Operation of the project alternatives would not result in changes to Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.	LS	LS	LS	LS
4.3.7: Operation of the new screened intake, or changes to diversions at existing intakes, could affect direct entrainment or impingement of fish	B	B	SU	LS
4.3.8: Fish screen maintenance activities would not significantly increase fish entrainment at the new Delta Intake or the expanded Old River Intake.	LS	LS	LS	NI
4.3.9: The project alternatives, when combined with other planned projects or projects under construction in the area, could cumulatively contribute to substantial adverse impacts to Delta fisheries and aquatic resources.	LSM	LSM	SU	LS

NOTES:

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact
B = Beneficial

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed and no existing facilities would be modified. CCWD operations in the near-term would be unchanged. To maintain supply reliability to its customers over time, CCWD would implement actions identified in its Future Water Supply Plan, including acquisition of water transfers as needed to provide reliable dry-year water supply. No increase in entrainment would occur at the CCWD intakes in the near term. However, under future levels of CCWD demand, there would be an expected increase in direct losses from these intakes.

CVP and SWP facilities and operations would not change in the near-term. CVP and SWP operations would be expected to change in the future in response to changes in future levels of demand, and also because of changes in infrastructure, as discussed in Section 4.1; however the modeling studies indicate very little change in operations under Future Without Project conditions compared to existing conditions. In the No Project/No Action alternative, CVP and SWP exports from the Delta continue to be made through their existing export facilities.

Impact 4.3.1: In-channel construction activities associated with the new Delta Intake structure would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Old River, which would increase exposure of various life stages and species of fish to temporarily degraded water quality conditions. (Less than Significant with Mitigation for Alternatives 1 and 2; No Impact for Alternatives 3 and 4)

Alternative 1

New Delta intake In-Channel Construction Activities

Under Alternative 1, a new Delta Intake would be constructed on Old River, south of the existing Old River Intake and Pumping Station. The new Delta Intake would include a trapezoidal concrete water intake structure with state-of-the-art positive barrier fish screens. An inlet channel and wet well would be downstream from the intake structure that would include louvered baffles or other structures to fine-tune velocity distribution through the intake screen. The intake structure would also include a pumping plant, water conveyance pipelines, and other infrastructure. An earthen setback levee would be installed to provide protection during construction of the intake and maintain continuity of the road system along the dike after construction. This setback levee would be a permanent structure and would be designed to contain Old River should the existing levee fail beside the intake structure.

Geotechnical conditions at the intake site show that the intake facility would need to be supported on a foundation system such as driven concrete, steel piles, or stone columns. Preliminary analysis indicates that piles would be founded at an elevation of about -50 feet relative to mean sea level (msl) and spaced about 15 feet apart on a square grid. In addition to the piles, soil densification would likely be required beneath the intake structure and setback levee to reduce the liquefaction potential of the soil and to improve its lateral strength during seismic events. Preloading of the soils beneath the levee may also be required to reduce long-term settlement of the levee.

Most of the in-channel construction activities associated with the new Delta Intake would be conducted in a dewatered cofferdam and would be isolated from Old River. A cofferdam would be installed in Old River to isolate the work area from the water and provide a means to conduct construction work in a dewatered environment. After installation of the cofferdam, the water in the cofferdam enclosure would be treated (as necessary) and discharged back to Old River, and the remaining intake construction work would be conducted in the dewatered construction area.

Excavation would be required in Old River, in the immediate vicinity of the new Delta Intake in an area of about 2,400 square feet. The need for excavation as part of site preparations before intake construction would be determined during final design based on the results of field bathymetry and geotechnical survey data. Excavated materials at the cofferdam site would be transferred to the designated containment or disposal areas on the land side of the levee. An earthen dike or siltation fences would enclose the containment area(s). Retention of the excavated materials would promote settling of the suspended sediments. Any excess water (desilted supernatant) would be returned back into Old River.

Benefits of Cofferdam

The use of a cofferdam would substantially reduce or avoid potential construction-related adverse impacts on water quality and fishery habitat. The use of a cofferdam during construction of the new Delta Intake and positive barrier fish screen to isolate the construction site and activities from the adjacent aquatic habitats is an important element of the project design that avoids and minimizes potentially significant adverse impacts to aquatic species and habitats within the Delta.

Use of a cofferdam to isolate intake construction activity from aquatic habitat within the adjacent waters has proven in other similar projects (e.g., RD 108 Wilkins Slough fish screen, RD 108 Poundstone fish screen and pumping plant, Sutter Mutual Water Company Tisdale fish screen, and others) to be an effective method for minimizing and avoiding fishery impacts. For example, suspended sediment concentrations within the river are reduced during site excavation, the risk of chemical spills entering the river is reduced, and the potential exposure of fish to underwater sounds during pile driving and foundation supports are reduced by the containment within the cofferdam. In addition, construction of a fish screen and intake structure within a cofferdam improves the fit and finish of the intake (e.g., better alignment of screen panels within the intake, smoother intake surfaces, improved screen seals) that serve to improve the performance of the intake in protecting fish during operations.

Potential Water Quality Impacts to Fish of In-Channel Construction

Installation of the cofferdam and excavation as part of site preparation would result in temporary localized increases in turbidity and suspended sediment concentrations. A substantial body of scientific information exists regarding the response of juvenile and adult chinook salmon, steelhead, and other fish and macroinvertebrates to elevated suspended sediment concentrations and turbidity (Hanson et al., 2004). For example, reduced feeding activity was reported for adult chinook salmon exposed to suspended sediment concentrations of 25 milligrams per liter (mg/L) over a 4-hour exposure period (Phillips, 1970). A 50 percent mortality for juvenile chinook salmon was observed after a 36-hour exposure to volcanic ash at a concentration of 9,400 mg/L, however no mortality or apparent adverse affects was observed on adult chinook salmon after a 24-hour exposure to volcanic ash at a suspended sediment concentration in excess of 39,000 mg/L (Newcombe and Flagg, 1983).

The extensive body of information available with respect to suspended sediment and turbidity effects on various life stages of chinook salmon and many other fish and macroinvertebrate species was used to determine potential impacts on aquatic species inhabiting Old River and other areas within the estuary. The potential for adverse effects resulting from suspended sediment and/or turbidity depends on the magnitude of the concentration of sediments, the duration of exposure, the type of material, the species and life stage of the organism, and other factors (Hanson et al., 2004).

Based on the construction of cofferdams at other intake structures, the increase in exposure to suspended sediment concentrations is expected to be below levels reported in the literature to cause adverse effects. The potentially adverse effects would be temporary and localized, and limited to those occurring during installation of the cofferdam.

The area temporarily affected by sedimentation and turbidity caused by installation or removal of the cofferdam is expected to be about 500 feet wide and 500 feet long, varying in size and shape depending on tidal conditions and flow within the Old River channel. It has been conservatively assumed that construction activities could affect habitat up to 1,000 feet upstream or downstream of the new intake site on Old River. These effects would occur intermittently during the estimated 60-day period at the beginning of construction and during the specified work window, when construction activity could disturb sediments and increase turbidity during construction.

The in-water construction activity associated with site preparation and installation of the cofferdam would occur during the summer and early fall (August 1 through November 30). That timing is consistent with the seasonal work window identified by USFWS, NMFS, and CDFG for reducing the potential for significant adverse impacts to sensitive fishery resources within the Delta.

Gasoline, oil, grease, concrete, and a variety of other chemicals and substances would be used during construction of the project alternatives. Construction activities could result in a chemical spill that could have adverse effects on Delta fisheries and aquatic resources. In the event of such a spill, the use of a cofferdam would help to contain these types of substances during construction, thus reducing the potential risk of exposing species to these materials. Hazardous Materials Mitigation Measure 4.13-2 involves best management practices to keep hazardous materials from accidental release.

Fish Species Potentially Affected by Cofferdam Installation

The assessment of potential construction-related impacts resulting from suspended sediment exposure during cofferdam installation has been based on the following:

- Results of fishery monitoring by CDFG within the Delta;

- Results of SWP and CVP export salvage monitoring showing the seasonal occurrence of various fish species and lifestages within the south Delta in the vicinity of the cofferdam and intake structure during the August 1 to November 30 in-river work window;
- Information on the expected sensitivity of various fish to exposure to suspended sediments (Hanson et al., 2004) associated with cofferdam installation, and
- The localized and intermittent effects of cofferdam installation.

Results of the assessment are summarized below.

Sacramento River winter-run chinook salmon. Adult winter-run chinook salmon migrate upstream through the Delta during the winter and spring months (late November to June) and therefore would not be expected to occur in the project area during the work window. Juvenile winter-run salmon inhabit upstream rearing areas within the Sacramento River and typically migrate downstream through the Delta during the late winter and early spring (November to May). Although a potential exists for juvenile winter-run salmon to be in the Delta in November, these juveniles occur primarily in the Sacramento River and are not concentrated in the south Delta in the vicinity of the project site.

Central Valley spring-run chinook salmon. Adult spring-run salmon migrate upstream through the Delta during the late winter and spring months (March to July) and therefore would not be expected to occur in the project area during the work window. Juvenile spring-run salmon inhabit upstream rearing areas within the rivers and typically migrate downstream through the Delta during the late winter and early spring, but may occur in the Delta in low numbers beginning as early as mid-October. These juveniles occur primarily in the Sacramento River and are not concentrated in the south Delta in the vicinity of the project site.

Central Valley fall/late fall-run chinook salmon. Adult fall-run chinook salmon returning to the San Joaquin River system migrate upstream through the Delta during the fall (primarily September to December). These adult fall-run salmon would potentially occur in the vicinity of the project alternatives during the work window. Late fall-run adult salmon migrate upstream starting around November, and would potentially occur in the Delta during the later part of the work window, however, the late fall-run salmon migrate upstream into the Sacramento River and would not be expected to be abundant in the south Delta in the vicinity of the project area. Results of studies have shown that adult salmon have a high tolerance, especially for short duration, to elevated concentrations of suspended sediments. Juvenile fall-run and late fall-run salmon inhabit upstream rearing areas within the rivers and typically migrate downstream through the Delta during the late winter and spring; some late fall-run juveniles may migrate downstream as early as November.

Central Valley steelhead. Adult steelhead migrate upstream through the Delta during the late fall and winter months. Juvenile steelhead inhabit upstream rearing areas within the rivers and typically migrate downstream through the Delta during the late winter and early spring (January to May).

Delta smelt. Juvenile and pre-spawning adult delta smelt inhabit Suisun Bay and areas of the western Delta during the summer months where water temperatures are suitable. Water temperatures in the south Delta in the project area are within the range considered to be highly stressful and unsuitable for delta smelt during the summer. Delta smelt migrate into the interior Delta and upstream into the rivers beginning in the fall. Although delta smelt are widely distributed geographically during the fall, the potential exists that individuals would occur in the project area during the later part of the work window. The broad distribution of delta smelt in the fall, their tolerance to a wide range of suspended sediment concentrations that occur naturally within the Delta, and the localized and intermittent effects of cofferdam installation reduce the potential impact of cofferdam installation to less than significant.

North American green sturgeon. Juvenile and adult sturgeon may occur in the project area during the construction window. Sturgeon are widely dispersed throughout the Bay-Delta estuary during the summer and fall and are not concentrated in the project area. Sturgeon are tolerant of exposure to high levels of suspended sediments.

Longfin smelt. Longfin smelt inhabit more marine waters within San Francisco Bay and near-shore coastal habitat during the summer and fall and would not be expected to be affected by construction of the intake.

Sacramento splittail. Juvenile and adult splittail may occur in the project area during the construction window. Habitat conditions in Old River are generally poor for splittail given the high velocities, deep water, and lack of emergent vegetation. Splittail are expected to have a high tolerance to suspended sediments based on information for similar species and their natural habitat conditions.

River lamprey. Juvenile lamprey inhabit riverine areas upstream of the Delta during the summer and fall and would not be expected to occur in the project area. Adult lamprey migrate into freshwater in the fall (Moyle, 2002) and would potentially occur in the project area during the work window. No specific information was found regarding the tolerance of adult lamprey to suspended sediment concentrations; however, based on their life history and exposure to elevated suspended sediments within the rivers and Delta, it is expected that tolerance would be high.

Hardhead. Hardhead inhabit low velocity freshwater habitat upstream of the Delta and would not be expected to occur in the project vicinity during the summer and fall.

Pacific smelt. Pacific smelt inhabit marine coastal waters during the summer and fall and would not be expected to occur or be affected by construction of the intake.

Northern anchovy. Northern anchovy inhabit more marine waters within San Francisco Bay and near-shore coastal habitat during the summer and fall and would not be expected to be affected by construction of the intake.

Pacific sardine. Pacific sardine inhabit more marine waters within San Francisco Bay and near-shore coastal habitat during the summer and fall and would not be expected to be affected by construction of the intake.

Starry flounder. Starry flounder inhabit more marine waters within San Francisco Bay and near-shore coastal habitat during the summer and fall. Starry flounder are expected to have high tolerance to suspended sediments based on tolerance for similar flatfish.

Striped bass. Juvenile and adult striped bass may occur in the project area during the construction window. Striped bass are widely dispersed throughout the Bay-Delta estuary during the summer and fall and are not concentrated in the project area. Striped bass are tolerant of exposure to high levels of suspended sediments.

White sturgeon. Juvenile and adult white sturgeon may occur in the project area during the construction window. White sturgeon are widely dispersed throughout the Bay-Delta estuary during the summer and fall and are not concentrated in the project area. Sturgeon are tolerant of exposure to high levels of suspended sediments.

Catfish. Juvenile and adult catfish may occur in the project area during the construction window. Habitat conditions in Old River are generally poor for catfish given the river's high velocities. Catfish are tolerant of exposure to high levels of suspended sediments.

Largemouth bass. Juvenile and adult largemouth bass may occur in the project area during the construction window. Habitat conditions in Old River are generally poor for bass given the high velocities, deep water, and lack of emergent vegetation. Bass are tolerant of exposure to high levels of suspended sediments.

Other sportfish. Sportfish such as halibut, perch, flounder and sole inhabit more marine waters within San Francisco Bay and would not be expected to be affected by construction of the intake.

Alternative 1 Summary

Implementation of the cofferdam during construction would prevent extended exposure of fish in the river to the potentially adverse effects of excavation and intake construction. The potentially adverse effects would be temporary and localized, and limited to those occurring during installation of the cofferdam.

Based on monitoring during construction of other cofferdams, the increase in exposure to suspended sediment concentrations is expected to be below levels reported in the literature to cause adverse effects. Thus, the seasonal in-channel construction window and cofferdam that are part of Alternative 1 are likely to prevent any significant impact from sedimentation or turbidity to special-status or regionally important game fish species from Delta water quality effects caused by construction. Because, however, of the residual risk that would remain from sedimentation and turbidity, or from the possibility of a chemical spill that could escape the containment area, this impact would be significant without concurrent implementation of Mitigation Measure 4.3.1 described below.

Alternative 2

Potential water quality impacts on Delta fisheries and aquatic resources resulting from in-channel construction activities associated with the new Delta Intake under Alternative 2 would occur to the same extent as those discussed for Alternative 1. With implementation of Mitigation Measure 4.3.1 described below, the impact would be less than significant.

Alternative 3

Expanded Old River Intake and Pump Station

Under Alternative 3, the existing Old River Intake would be expanded to 320 cubic feet per second (cfs); the Old River intake structure would not need to be changed to allow for the capacity increase. Additional fish screens would be installed in existing bays, the existing automated fish screen cleaning system would be modified to accommodate the new screens, and additional baffles or screen panels would be installed if needed to achieve uniform velocities throughout the intake structure. All of the intake construction activities would occur within the existing footprint of the facility and no in-channel construction activities would be required at the Old River Intake and Pump Station to expand the capacity to 320 cfs. This is because the concrete structure for the additional intake capacity is already in place, and the expansion of the intake structure would involve replacement of existing solid plates with additional screens, which can be done from the existing facility without working in the river channel. Thus, no impacts to Delta fish species would occur due to construction.

Alternative 4

Under Alternative 4, no new Delta intake would be constructed and the existing Old River Intake would not be expanded. This alternative would not involve any in-channel construction activities. Thus, no impacts to fisheries resources and aquatic habitat from in-channel construction activities would occur under Alternative 4.

Mitigation Measures

Implementation of Hazardous Materials Mitigation Measure 4.13.2: This mitigation measure involves implementation of best management practices to keep hazardous materials from accidental release. See Section 4.13 for description of this measure.

Implementation of Hydrology Mitigation Measures 4.5.1a: This mitigation measure specifies preparation and implementation of a storm water pollution prevention plan. See Section 4.5 for description of this measure.

Measure 4.3.1: To minimize sediment, turbidity, and contaminants in Old River during construction of the new Delta Intake (primarily excavation and cofferdam installation), CCWD or its contractors will obtain and comply with RWQCB Section 401 water quality certification, CDFG streambed alteration agreement, USACE Clean Water Act Section 404 permit, as needed, and adhere to the following requirements:

- Monitor periods of construction activity and coordinate with the contractor to identify periods when localized increases in turbidity may occur.

- Install a silt curtain to reduce the dissipation of suspended sediments during dredging and cofferdam installation.

- Ensure that cofferdam(s) installation occurs during the designated construction window of August 1 through November 30 to avoid the potential risk of adverse impacts on chinook salmon, steelhead, delta smelt, and other aquatic species which are more abundant in the area during fall, winter, and spring. This construction window may be shifted through consultation with USFWS, NMFS, and CDFG if the best available fish survey data indicate that a different construction window for cofferdam installation will avoid or minimize effects on special-status species.

- Minimize substrate disturbance during construction activities.

- Ensure project construction activities will not cause significant turbidity increases in surface waters, as follows:

  - Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTU), increases will not exceed 1 NTU.
  - Where natural turbidity is between 5 and 50 NTU, increases will not exceed 20 percent.
  - Where natural turbidity is between 50 and 100 NTU, increase will not exceed 10 NTU.
  - Where natural turbidity is greater than 100 NTU, increases will not exceed 10 percent.

  These limits will be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging periods may be applied, provided that Delta fisheries and aquatic resources would be fully protected.

- Ensure project construction activities will not cause settleable matter to exceed 0.1 milliliters per liter in surface waters, as measured in surface waters 300 feet downstream from the project.

- In the event that project construction activities create a visible plume in surface waters, initiate monitoring of turbidity levels at the discharge site and 300 feet downstream, taking grab samples for analysis of NTU levels twice per day during the work period while the visible plume persists.

- Notify the RWQCB, CDFG, USFWS, and NMFS if the above criteria for turbidity are exceeded.

- Notify the RWQCB, CDFG, USFWS, and NMFS of any spill of petroleum products, oil/grease, or other organic or earthen materials.

- If the required permits from RWQCB, CDFG, USFWS or NMFS include conditions equivalent to any mitigation measure set forth above, substitute the permit condition for the equivalent mitigation measure.

Impact Significance after Mitigation: Less than Significant.

Impact 4.3.2: Underwater sound-pressure levels generated during cofferdam installation for the new Delta Intake could result in behavioral avoidance or migration delays for special-status fish species. (Less than Significant with Mitigation for Alternative 1 and 2; No Impact for Alternatives 3 and 4)

Alternative 1

Installation of the cofferdam for construction of the new Delta Intake would be performed using a vibration hammer, a percussion hammer, or both, depending on substrate conditions. Observations during construction of the Bay Bridge and other projects within the Bay-Delta estuary that involve pile driving have shown adverse effects, including fish kills, resulting from pile driving when underwater sound pressure levels are high. Information obtained from the scientific literature and through field observations at other construction sites within the Bay-Delta estuary indicates that exposure of fish species to underwater sound-pressure levels exceeding about 180 decibels (dB) may result in sublethal or lethal effects. Exposure of fish to underwater sound-pressure levels exceeding about 160 dB may result in behavioral avoidance or migration delays.

Cofferdam installation using percussion hammers and, to a lesser degree, vibrational hammers create underwater sound pressure levels that may adversely affect fish species. Fish may be injured or killed by the impact sounds generated by percussive pile driving. Their hearing may also be affected or their behavior altered such that it constitutes harassment or harm. The specific effects of underwater sound pressures on fish depend on a wide range of factors including the type of hammer, fish species, environmental setting, and many other factors (Popper et al., 2006).

The loss of hearing sensitivity may adversely affect a salmonid's ability to orient itself (due to vestibular damage), detect predators, locate prey, or sense their acoustic environment (NMFS, 2006). Fish also may exhibit noise-induced avoidance behavior that causes them to move into less-suitable habitat. During cofferdam installation activities for the new Delta intake component of the project alternatives, this may result in salmonids fleeing the project area. Likewise, chronic noise exposure can reduce their ability to detect piscine predators, either by reducing the sensitivity of the auditory response in the exposed salmonid or by masking the noise of an approaching predator. Disruption of the exposed salmonid's ability to maintain position or swim with the school may enhance its potential as a target for predators. Non-salmonid special-status species, including delta smelt, are likely affected in similar manners.

Because Old River serves as a migration corridor for juvenile and adult chinook salmon migrating to and from San Joaquin River tributaries, and also serves as seasonal habitat for delta smelt and other resident and migratory fish, underwater sound pressures generated during cofferdam installation could adversely affect special-status fish species. Winter-run chinook salmon, spring-run salmon, fall-run and late fall-run salmon, steelhead, green sturgeon, longfin smelt, splittail, and lamprey are most abundant in the south Delta in the vicinity of the project alternatives during the late fall, winter, and spring. Limiting pile driving and installation of the cofferdam to the summer and early fall would reduce and avoid potential impacts to these special-status species.

Many of the other special-status species and recreationally important species, such as hardhead, Pacific smelt, northern anchovy, Pacific sardine, starry flounder, halibut, perch, flounder, and sole occur rarely in the Delta (habitats for these species are either upstream or downstream of the Delta) and would not be expected to significantly impacted by project construction. Several of the species supporting recreational angling, such as striped bass, catfish, and largemouth bass are present, but widely distributed, in the Delta throughout the year.

Limiting the seasonal period of in-water construction activity such as installation of the cofferdam to the summer and early fall (August 1 through November 30) serves to reduce the potential for adverse impacts to sensitive fish species such as juvenile chinook salmon, steelhead, delta smelt and longfin smelt, resulting from exposure to underwater sound pressure levels. Many other fish species are resident within the south Delta year-round and would potentially be adversely impacted by elevated underwater sound pressure levels from cofferdam installation. This would be a significant impact without concurrent implementation of mitigation measure 4.3.2, described below.

Alternative 2

The potential impact on Delta fisheries and aquatic resources resulting from underwater sound pressures from cofferdam installation for the new Delta Intake under Alternative 2 would be the same as that discussed for Alternative 1. This would be a significant impact without concurrent implementation of mitigation measure 4.3.2, described below.

Alternative 3

Alternative 3 entails installation of new fish screens into existing bays at the Old River Intake, but does not require in-channel work, or the associated installation of a cofferdam. Thus, no underwater sound pressure impacts to fisheries resources would occur under Alternative 3.

Alternative 4

Under Alternative 4, no new Delta intake would be constructed on Old River and the existing Old River Intake and Pump Station capacity would not be expanded. There would be no in-channel construction activities. Thus, no underwater sound pressure impacts to fisheries resources would occur.

Mitigation Measures

Measure 4.3.2: As discussed in Mitigation Measure 4.3.1, construction of the cofferdam for the new Delta Intake will be limited to the seasonal period between August 1 and November 30. This measure will also help avoid potential impacts to special-status fish species due to underwater sound pressure levels generated during coffer dam installation.

To further reduce and avoid impacts to resident fish present in the south Delta in the immediate vicinity, the cofferdam would be installed using a vibration hammer that minimizes underwater sound pressure levels.

If it is determined that a higher intensity percussion hammer would be required for installing the cofferdam, underwater sound pressure level monitoring would be performed by an acoustic expert to document sound pressure levels during cofferdam construction. Limiting construction related underwater sound pressure levels during cofferdam installation to less than 160 dB would reduce potential fishery impacts to a less-than-significant level. If monitoring indicates higher sound pressure levels than 160 dB, in-water construction activity would be suspended and avoidance of potential adverse effects would be achieved by consulting with USFWS, NMFS, and CDFG to determine and implement the appropriate actions, which would include one or more of the following:

- Surveying Old River at the intake site to determine fish presence before installation, and modifying the work window accordingly;
- Use of an air bubble curtain to deflect and absorb sound pressure;
- Use of lower intensity underwater sounds to repel fish from the immediate construction area before use of a high-pressure hammer;
- Limiting the duration and frequency of high-pressure underwater sound levels during cofferdam installation.

Impact Significance after Mitigation: Less than Significant.

Impact 4.3.3: Dewatering of the cofferdam for the new Delta Intake could result in stranding of fish. (Less than Significant with Mitigation for Alternatives 1 and 2; No Impact for Alternatives 3 and 4)

Alternative 1

Dewatering of the cofferdam for intake and fish screen construction activities at the new Delta Intake has the potential to strand fish and macroinvertebrates during the dewatering process. As water is lowered from the pool behind the cofferdam, the trapped fish and macroinvertebrates have no opportunity to escape. Without mitigation measures, all aquatic fish and most macroinvertebrates would be stranded and fish mortality would be 100 percent. This would be a significant impact without concurrent implementation of Mitigation Measure 4.3.3, described below.

Alternative 2

Potential impacts on Delta fisheries and aquatic resources resulting from stranding during cofferdam dewatering under Alternative 2 would be the same as those described for Alternative 1. This would be a significant impact without concurrent implementation of Mitigation Measure 4.3.3, described below.

Alternative 3

Alternative 3 entails installation of new fish screens into existing bays at the Old River Intake, but does not require in-channel work, nor the associated installation of a cofferdam. Thus, no stranding impacts to fisheries resources would occur under Alternative 3.

Alternative 4

Under Alternative 4, no new Delta Intake would be constructed and the existing Old River Intake capacity would not be expanded. There would be no in-channel construction activities and no stranding impacts to fishery resources.

Mitigation Measures

Measure 4.3.3: As discussed in Mitigation Measure 4.3.1, construction of the cofferdam for the new Delta Intake will be limited to the seasonal period between August 1 and November 30. This measure will also help avoid potential impacts to special-status fish species due to coffer dam dewatering.

Additionally, CCWD will implement a fish rescue plan acceptable to CDFG, USFWS, and NMFS. CCWD shall ensure that a qualified fishery biologist designs and conducts the fish rescue and relocation effort to collect fish (all species) from the area behind the cofferdam. The fish rescue would be implemented during the dewatering of the area behind the cofferdam for the new Delta Intake and would involve capturing and relocating the fish to suitable habitat within Old River. To ensure compliance, a fisheries biologist shall be present onsite during initial dewatering activities.

CCWD shall monitor progress of installation of the cofferdam and the schedule for dewatering. CCWD shall coordinate the dewatering schedule with the construction contractor and fishery biologist to allow for the fish rescue to occur before completely closing the cofferdam, and again during dewatering when water is about 2 feet deep at the shallowest point within the cofferdam. USFWS, NMFS, and CDFG shall be notified at least 48 hours before the fish rescue. Information on the species and sizes of fish collected in the rescue and estimates of survival just before release would be recorded during the time of the fish rescue and provided in a letter report to be submitted within 30 days after the fish rescue to USFWS, NMFS, and CDFG.

Impact Significance after Mitigation: Less than Significant.

Impact 4.3.4: The new Delta Intake structure and associated fish screens in Old River would physically exclude fish from a small area of existing aquatic habitat and modify existing aquatic habitat. (Less than Significant with Mitigation for Alternatives 1 and 2; No Impact for Alternatives 3 and 4)

Alternative 1

New Delta intake

The new Delta Intake, including associated fish screens and pumping plant, would be constructed along the existing levee on Old River. This project component would permanently exclude fish from a small area of existing open water and emergent wetland habitat and would modify existing substrate habitat.

Lost habitat. Aquatic habitat at the intake site is characterized as highly disturbed, degraded, and not unique. Nevertheless, habitat in the vicinity of the intake location is used by resident fish and macroinvertebrates for spawning, juvenile rearing, migration, foraging, and adult holding. Adult and juvenile chinook salmon and steelhead use the area as a migratory corridor and juvenile rearing area during downstream migration. Delta smelt, longfin smelt, and sturgeon are known to occur in the area. Resident fish species, such as striped bass, catfish, and largemouth bass, inhabit the area year-round. Depending on final site selection, up to about 0.2 acre of emergent wetland and open water habitat may be lost as a result of project implementation.

Altered habitat. The habitat within Old River at the new Delta intake site is characterized by riprap-stabilized levees and silt and sand substrate. Tules and other emergent vegetation associated with shallow water habitat occur in the general area.

To stabilize local channel banks, riprap would be installed along the existing levee for a distance of up to 500 feet upstream and downstream of the new intake. Assuming that riprap would extend vertically from +8 feet msl (100-year flood elevation) to about -25 feet msl (presumed channel bottom), a combined total of up to 0.74 acre of riprap will placed along the sides of the intake. Additionally, assuming that the intake sill elevation will be at -12.5 feet msl and the length of the intake will be about 180 feet, a total of up to 0.05 acre of riprap will be placed along the channel bank and bottom below the intake. The total area of riprap would be up to 0.79 acre. Because much of this riprap would be replacement of existing riprap which currently lines both levees along Old River, the new riprap would not significantly change aquatic habitat conditions.

The loss of aquatic habitat described above would be a significant impact without concurrent implementation of Biological Resources Mitigation Measure 4.6.2b.

Alternative 2

Potential impacts on Delta fisheries and aquatic resources resulting from aquatic habitat loss under Alternative 2 would be the same as those discussed for Alternative 1 and would be significant without concurrent implementation of Biological Resources Mitigation Measure 4.6.2b. Potential impacts on Delta fisheries and aquatic resources resulting from alteration of existing aquatic habitat under Alternative 2 would be the same as those discussed for Alternative 1 and would be less than significant.

Alternative 3

Expanded Old River Intake and Pump Station

Under Alternative 3, the Old River Intake and Pump Station capacity would be expanded to 320 cfs by installing additional screens into existing, vacant bays. Because this expansion work would not involve any in-channel construction activities, no aquatic habitat loss or modification would occur. No new Delta intake would be constructed under Alternative 3. Thus, no aquatic habitat loss or modification would occur under Alternative 3.

Alternative 4

Under Alternative 4, no new Delta intake would be constructed and the existing Old River Intake and Pump Station capacity would not be expanded. There would be no in-channel construction activities. Thus, no aquatic habitat loss or modification would occur under Alternative 4.

Mitigation Measures

Implementation of Biological Resources Mitigation Measure 4.6.2b: This mitigation measure provides for compensatory mitigation for the permanent impacts to habitat. See Section 4.6 for description of this measure.

Impact Significance after Mitigation: Less than Significant.

Impact 4.3.5: The new Delta Intake structure and associated fish screens in Old River would modify hydraulic conditions next to the intake structure, but would not disorient special-status fish or attract predatory fish. (Less than Significant for Alternatives 1 and 2; No Impact for Alternatives 3 and 4)

Alternative 1

The new Delta Intake structure would contribute to localized changes in hydraulic conditions (e.g., water velocities, water depths, and water circulation periods) within Old River in the immediate vicinity of the intake structure. These changes in current patterns could affect localized movement patterns for fish and macroinvertebrates within the area. Concern has also been expressed that physical structures, such as an intake and fish screen as well as riprap bank stabilization within the Delta, would attract predatory fish and increase the vulnerability of prey (e.g., juvenile chinook salmon, steelhead, delta and longfin smelt, splittail, and other fish), to predation mortality.

The new Delta Intake structure and fish screens would be designed and oriented in the channel to reduce the effect of the structure on local turbulence and to minimize changes in local hydrodynamic current patterns within Old River. The dominant flow and current patterns in Old River reflect the combined result of tidal flows and pumping at the SWP and CVP export facilities.

The fish screen would be positioned so that the river flow would primarily be oriented parallel to the fish screen surface, resulting in relatively large sweeping (parallel to screen) velocities as compared to approach velocities (perpendicular to screen). Results of field velocity measurements at other similarly positioned intake structures and fish screens (e.g., RD108 Wilkins Slough Pumping Plant) have shown that the effect of through-screen pumping on local hydrodynamics, as indicated by measurable approach velocities, extends less than 1 foot from the screen surface. Old River in the vicinity of the new Delta Intake is about 300 to 500 feet wide, so the modified hydraulic conditions would extend about 0.3 percent of the width of Old River at this location.

Based on observations at other intake locations with similar structures to the new Delta Intake, it would be expected that local effects of the structure on turbulence and current patterns would be limited to only the area of the channel in the immediate vicinity of the structure (e.g., less than 100 feet upstream and downstream of the structure). As part of designing the intake structure, simulation modeling and analyses would be performed of local hydrodynamic conditions in the area of the intake and the ability of the intake to maintain a uniform approach velocity of 0.2 fps or less. The intake design and support information would be made available for review by state and federal agency engineers during the design process to identify any potential changes or refinements to the design and hydraulic performance of the intake.

After intake construction, approach and sweeping velocities would be measured and the intake baffles or other similar structure adjusted to ensure uniformity of approach velocities and compliance with the CDFG and NMFS design criteria. Experience and observations at other intake structures with similar design criteria indicate that the new Delta Intake would not significantly influence hydrodynamic conditions within Old River or adversely affect fish behavior or migration. The intake structures would not affect the channel cross-section and would not create a physical barrier or impediment to migration.

Physical structures such as water intakes and diversion facilities may attract various species of fish to the area. A number of predatory fish species, such as striped bass and largemouth bass, are attracted to water intake facilities, where they prey on juvenile fish. Experience and observations of fish predation at other water diversion and intake sites within the Sacramento River and Delta (e.g., RBDD, Clifton Court forebay, Woodbridge Irrigation District dam) have shown that increased vulnerability of fish such as juvenile chinook salmon and steelhead to predation is typically related to physical structures that create turbulence and disorient fish.

The risk of attracting predatory fish species to the new Delta intake structure, or the potential risk of increased predation mortality for fish migrating through or inhabiting the south Delta, would be minimized by designing the intake and fish screen to avoid areas where predatory fish would congregate (e.g., avoid structural elements of the intake that create turbulence and structures that provide cover and hiding/ambush locations for predators). In addition, the intake and fish screen would not include collection or bypasses/fish return systems that have been found to attract predators and increase the concentrations of prey fish and their vulnerability to predation. The distribution of predatory fish inhabiting the area right next to the intake structure could change as a result of project implementation, but an increase in the overall abundance of predatory fish inhabiting Old River in the vicinity of the new Delta Intake is not expected.

As described in Impact 4.3.4 above, the new Delta Intake would require replacement of a small amount of existing silt/sand substrate with riprap to stabilize local channel banks just upstream and downstream of the intake structure. The existing channel banks, along the reach of Old River where the new Delta Intake would be sited, are currently lined by riprap, both upstream and downstream of the site. As part of intake construction, existing riprap would be removed from the site and replaced after the intake construction is complete to ensure that the local levees are stable and protected from scour and erosion by high tidal water velocities that occur in the channel.

Results of fishery surveys conducted by CDFG within the Delta have shown that predatory fish, such as striped bass, are frequently associated with riprap channel banks. No studies have been conducted within the Delta to quantify the effects of riprap on predation mortality for special-status fish. Fishery studies conducted in the Pacific Northwest (e.g., Knudsen and Diley, 1987; Peters et al., 1998) have found both positive and negative effects of riprap on the distribution and occurrence of juvenile salmonids. Because riprap is currently present and used to stabilize channel levees within Old River, and the new Delta Intake would replace existing riprap with new riprap, the addition of a small extent of riprap would not be expected to significantly affect the vulnerability of special-status species to predation within Old River or their ability to avoid predators, when compared to without project conditions.

These considerations indicate that incremental changes in localized hydraulics and aquatic habitat characteristics, including predator attraction, would be minor. Thus, this impact would be less than significant.

Alternative 2

Potential impacts on Delta fisheries and aquatic resources resulting from changes in hydraulic conditions under Alternative 2 would be the same as those discussed for Alternative 1. This impact would be less than significant.

Alternative 3

Under Alternative 3, no physical in-channel alterations would be required to expand the existing intake capacity at the Old River Intake and Pump Station to 320 cfs, because the capacity enlargement entails replacement of existing solid plates in existing intake bays with new screens. This replacement would not change the existing channel geometry. No new Delta intake would be constructed for this alternative. Thus, potential impacts on Delta fisheries and aquatic resources resulting from changes in hydraulic conditions would not occur.

Alternative 4

Under Alternative 4, the Old River Intake and Pump Station would not be expanded and no new Delta intake would be constructed. Thus, potential impacts on Delta fisheries and aquatic resources resulting from changes in hydraulic conditions next to the intake structure would not occur.

Mitigation: None required.

Impact 4.3.6: Operation of the project alternatives would not result in changes to Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta. (Less than Significant)

The project alternatives would alter the location and timing of water diversions from the Delta. The following analysis addresses the potential for these changes to adversely or beneficially affect Delta fish populations or the quality and quantity of aquatic habitat within the Bay-Delta estuary.

Effects on fish populations were analyzed using a number of different parameters that have been shown to be, or are thought to be, significant factors that affect habitat conditions and the reproduction of various fish and macroinvertebrate species inhabiting the Bay-Delta estuary. These habitat parameters are grouped into the following three categories:

- Measures of flows upstream of the Delta, including total Delta inflow, Sacramento River flow at Freeport, and San Joaquin River flow at Vernalis;
- Regulatory standards that are currently required by SWRCB D-1641 for fish and wildlife beneficial use, including net Delta outflow, the location of X2, and the Export-to-Inflow (E/I) ratio;
- Measures of Delta circulation, including particle tracking analysis, net flow on the lower San Joaquin River (Qwest), and net flow in Old and Middle rivers.

The assessment relies on a comparative analysis of operational and resulting environmental conditions within the estuary between without project conditions and each of the project alternatives. The changes in these parameters for each alternative are obtained from the hydrologic modeling results, which describe water diversion operations over a range of environmental and hydrologic conditions (see Appendix C for a detailed presentation of the modeling methodology and results). Hydrologic modeling results provide the technical foundation for assessing adverse effects of project diversions and CVP and SWP export operations on fish species and their habitat within the Bay-Delta estuary.

As described in Section 4.2 and Appendix C-3, moderate and severe fishery restrictions were simulated, in an attempt to bracket the range of background conditions that might occur, and evaluate the environmental effects of the project alternatives under this range of conditions. Additionally, comparisons were performed for both the 2005 level of development and the 2030 level of development. For the 2005 level of development, the project alternatives are compared to the Existing Condition. For the 2030 level of development, the project alternatives are compared to the Future Without Project condition.

Changes to each of the parameters were evaluated on a monthly basis. For the purpose of evaluating the potential effect of each project alternative, the incremental changes for each alternative are averaged by water year type, resulting in a long-term monthly average for each water year type (e.g., long-term average incremental change in January of wet water years). Results of this analysis are discussed below. Summary tables are presented below that show long-term monthly average (e.g., long-term average incremental change in January for all years); the monthly average values by water year type that were the basis for the analysis are presented in Appendix C-7.

Effects of changes to upstream tributary river flows

Delta Inflow. Changes in Delta inflow could be caused by the operation of the project alternatives, if the alternatives would influence the timing of releases from upstream reservoirs, including but not limited to Shasta, Oroville, and Folsom. Changes in Delta inflow could affect hydrologic conditions within Delta channels, hydraulic residence times, salinity gradients, and the transport and movement of various lifestages of fish, invertebrates, phytoplankton, and nutrients into and through the Delta. Delta inflow serves as a surrogate metric for a variety of habitat conditions within the Delta that directly or indirectly affect fish and other aquatic resources.

Long-term average changes to Delta inflows under 2005 level of development are shown in **Table 4.3-5** with additional averages by water year presented in Appendix C-7. For purposes of evaluating the potential effect of changes in Delta inflow on fishery habitat within the Bay-Delta, and considering the accuracy and inherent noise within the hydrologic model, changes in the average monthly simulated flows that were within 5 percent (+ or -) of the Existing Condition would not be expected to result in a detectable effect on habitat quality or availability or affect the transport mechanisms provided by Delta inflow, which may influence resident or migratory fish or the zooplankton and phytoplankton that they rely on for a food resource.

TABLE 4.3-5
LONG-TERM MONTHLY AVERAGE OF DELTA INFLOW UNDER 2005 LEVEL OF DEVELOPMENT

Delta Inflow (cfs) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		14,752	19,273	32,886	49,983	60,786	50,834	33,691	27,564	21,162	21,913	17,433	16,396
Percent Change from Existing Condition	Alt 1	-0.1%	-0.2%	-0.1%	0.0%	-0.1%	0.0%	-0.1%	0.1%	0.4%	0.3%	-0.3%	-0.1%
	Alt 2	-0.1%	-0.2%	-0.1%	0.0%	-0.1%	0.0%	-0.1%	0.1%	0.4%	0.6%	-0.2%	-0.2%
	Alt 3	-0.1%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.3%	0.1%	0.0%	0.6%
	Alt 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		14,979	19,138	32,757	49,911	60,770	50,906	33,731	27,556	22,293	21,511	16,845	16,394
Percent Change from Existing Condition	Alt 1	0.3%	0.1%	0.0%	0.0%	-0.1%	0.1%	-0.3%	0.2%	0.3%	0.2%	-0.5%	-0.2%
	Alt 2	0.0%	0.0%	0.0%	-0.1%	-0.1%	0.1%	-0.2%	0.2%	0.4%	0.3%	-0.5%	-0.1%
	Alt 3	0.1%	0.2%	0.1%	0.0%	-0.2%	0.1%	0.0%	0.0%	-0.5%	0.2%	-0.5%	0.7%
	Alt 4	0.2%	-0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	-0.3%	0.1%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

Results of the analysis showed that Delta inflow under 2005 level of development was slightly lower in a number of comparisons between without project conditions and the project alternatives and slightly higher in a number of comparisons. However, the changes in Delta inflow attributable to the project are generally less than 1 percent, and none are larger than 5 percent. Typically only a change that reduced average monthly Delta inflow would be considered to have a potentially adverse effect on fishery resources. Based on results of this analysis it was concluded that the project alternatives would result in a less than significant incremental effect on fishery habitat as a consequence of changes in Delta inflow under 2005 level of development.

Long-term average changes to Delta inflows under 2030 level of development are shown in **Table 4.3-6** with additional averages by water year presented in Appendix C-7. Similar to the 2005 level of development, Delta inflows under 2030 level of development were observed to be slightly lower under many of the project alternatives operations as well as slightly higher than Future Without Project conditions depending on month and water year type. None of the comparisons between the Future Without Project and operations under the project alternatives exceeded 5 percent.

TABLE 4.3-6
LONG-TERM MONTHLY AVERAGE OF DELTA INFLOW UNDER 2030 LEVEL OF DEVELOPMENT

Delta Inflow (cfs) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		14,091	18,971	32,794	50,056	60,826	50,781	33,790	27,471	20,961	22,159	17,374	15,759
Percent Change from Future Without Project	Alt 1	-0.1%	0.0%	0.0%	-0.1%	-0.1%	0.0%	-0.2%	0.1%	0.4%	0.2%	-0.2%	-0.1%
	Alt 2	-0.1%	-0.4%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	0.1%	0.6%	0.4%	-0.1%	-0.1%
	Alt 3	0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.3%	-0.1%	-0.1%	0.4%
	Alt 4	0.0%	-0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		14,365	18,692	32,385	49,654	60,512	50,742	33,783	27,544	22,156	22,029	17,188	16,042
Percent Change from Future Without Project	Alt 1	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	-0.3%	0.2%	0.1%	0.1%	-0.3%	-0.1%
	Alt 2	-0.1%	0.1%	-0.1%	0.0%	0.0%	0.1%	-0.2%	0.2%	0.3%	0.1%	-0.2%	-0.1%
	Alt 3	0.3%	0.1%	0.0%	0.0%	-0.1%	0.0%	0.1%	-0.2%	-0.7%	0.0%	-0.2%	0.9%
	Alt 4	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.1%	0.1%	-0.1%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

The results of this comparison indicate that each of the project alternatives would have a less than significant incremental effect on fishery habitat and hydrologic transport processes within the Delta and Suisun Bay.

Sacramento River Flow. Flow within the Sacramento River has been identified as an important factor affecting the survival of emigrating juvenile chinook salmon, and as important to the downstream transport of planktonic fish eggs and larvae such as delta and longfin smelt, striped bass and shad. Sacramento River flows have also been identified as important for seasonal floodplain inundation that has been shown to be important habitat for successful spawning and larval rearing by species such as Sacramento splittail and as seasonal foraging habitat for juvenile chinook salmon and steelhead (Sommer et al., 2001). Sacramento River flows are also important in the transport of organic material and nutrients from the upper regions of the watershed downstream into the Delta. A reduction in Sacramento River flow as a result of operation of the project alternatives, depending on the season and magnitude of change, could adversely affect habitat conditions for both resident and migratory fish species. An increase in river flow is generally considered to be beneficial for aquatic resources within the normal range of typical project operations and flood control. Very large changes in river flow could also affect sediment erosion, scour, deposition, suspended and bedload transport, and other geomorphic processes within the river and watershed.

Results of the comparative analysis of Sacramento River flow, by month and water year type, under both 2005 and 2030 levels of development are provided in Appendix C-7 with long-term monthly averages shown in **Table 4.3-7** and **Table 4.3-8,** respectively. Results of these analyses show a variable response in Sacramento River flow with the operations of the project alternatives resulting in both increases and decreases in river flow compared to without project conditions, depending on month and water year. Changes in estimates of SWP and CVP operations in the CalSim II studies for project alternatives result in changes in flow on the Sacramento River, but changes attributable to the operation of project alternatives are less than 5 percent, and are generally less than 1 percent.

TABLE 4.3-7
LONG-TERM MONTHLY AVERAGE OF SACRAMENTO RIVER INFLOW TO THE DELTA UNDER 2005 LEVEL OF DEVELOPMENT

Sacramento River Inflow to Delta (cfs) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		11,910	15,539	25,741	34,475	40,240	34,931	24,085	19,836	15,575	18,272	14,880	13,410
Percent Change from Existing Condition	Alt 1	-0.1%	-0.2%	-0.1%	0.0%	-0.1%	0.0%	-0.2%	0.2%	0.5%	0.4%	-0.4%	-0.1%
	Alt 2	-0.1%	-0.2%	-0.1%	-0.1%	0.0%	0.0%	-0.2%	0.1%	0.6%	0.7%	-0.2%	-0.3%
	Alt 3	-0.2%	0.0%	-0.1%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.4%	0.1%	0.0%	0.8%
	Alt 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.1%	0.0%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		12,136	15,406	25,620	34,425	40,290	35,005	24,146	19,826	16,705	17,866	14,287	13,406
Percent Change from Existing Condition	Alt 1	0.4%	0.1%	0.0%	0.0%	-0.2%	0.1%	-0.4%	0.3%	0.4%	0.2%	-0.6%	-0.2%
	Alt 2	0.0%	0.0%	0.0%	-0.1%	-0.1%	0.1%	-0.3%	0.3%	0.5%	0.3%	-0.5%	-0.2%
	Alt 3	0.2%	0.2%	0.0%	0.0%	-0.3%	0.2%	0.0%	0.0%	-0.7%	0.2%	-0.6%	0.9%
	Alt 4	-0.2%	-0.1%	0.0%	0.0%	-0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	-0.4%	0.2%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

TABLE 4.3-8
LONG-TERM MONTHLY AVERAGE OF SACRAMENTO RIVER INFLOW TO THE DELTA UNDER 2030 LEVEL OF DEVELOPMENT

Sacramento River Inflow to Delta (cfs) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		11,263	15,242	25,678	34,526	40,358	35,075	24,196	19,785	15,451	18,539	14,870	12,791
Percent Change from Future Without Project	Alt 1	-0.1%	0.1%	0.0%	-0.1%	0.0%	0.0%	-0.2%	0.1%	0.6%	0.3%	-0.2%	-0.1%
	Alt 2	-0.1%	-0.5%	-0.1%	-0.1%	0.0%	0.0%	-0.2%	0.1%	0.8%	0.5%	-0.1%	-0.2%
	Alt 3	0.1%	-0.1%	-0.1%	0.0%	-0.1%	0.1%	0.0%	-0.1%	-0.4%	-0.1%	-0.1%	0.5%
	Alt 4	0.0%	-0.2%	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.0%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		11,533	14,982	25,486	34,318	40,232	34,988	24,241	19,857	16,644	18,406	14,680	13,073
Percent Change from Future Without Project	Alt 1	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	-0.4%	0.3%	0.1%	0.1%	-0.3%	-0.2%
	Alt 2	-0.1%	0.1%	-0.1%	0.0%	0.0%	0.1%	-0.3%	0.3%	0.3%	0.2%	-0.3%	-0.1%
	Alt 3	0.4%	0.2%	0.1%	0.0%	-0.2%	0.0%	0.0%	-0.2%	-0.9%	0.0%	-0.2%	1.1%
	Alt 4	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%	0.1%	0.1%	-0.1%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

Based on these results, it was concluded that the incremental effect of the project alternatives on fishery habitat and transport mechanisms within the lower Sacramento River and Delta would be less than significant.

San Joaquin River Flow at Vernalis. Flow within the San Joaquin River has been identified as an important habitat parameter because it is known to affect:

- the survival of juvenile chinook salmon migrating downstream from the tributaries through the mainstem San Joaquin River and Delta;
- downstream transport of planktonic fish eggs and larvae such as striped bass;
- seasonal floodplain inundation that is considered to be important habitat for successful spawning and larval rearing by species such as Sacramento splittail and as seasonal foraging habitat for juvenile chinook salmon;
- transport of organic material and nutrients from the upper regions of the watershed downstream into the Delta.

A reduction in San Joaquin River flow as a result of operations of the project alternatives, depending on the season and magnitude of change, could adversely affect habitat conditions for both resident and migratory fish species. An increase in river flow is generally considered to be beneficial for aquatic resources within the normal range of typical project operations and flood control. Very large changes in river flow could also affect sediment erosion, scour, deposition, suspended and bedload transport, and other geomorphic processes within the San Joaquin River and watershed.

Results of the comparative analysis of San Joaquin River flow, by month and year type under 2005 and 2030 level of development, are provided in Appendix C-7 with long-term monthly averages presented in **Table 4.3-9** and **Table 4.3-10**. Results of these analyses show that the project alternatives would have little effect on seasonal flows as compared with existing conditions within the San Joaquin River (percent change remains below 0.05 percent). Similarly, modeling results showed that the project alternatives would have little effect on flows or fishery habitat as compared with Future Without Project conditions.

These results indicate that the project alternatives would have a less than significant incremental effect on fishery habitat or transport mechanisms within the lower San Joaquin River and Delta under either current or future conditions.

Effects of changes to net Delta outflow, the location of X2, and the Export-to-Inflow Ratio

Delta outflow. Seasonal variations in Delta outflow influence the transport of planktonic organisms, such as zooplankton, fish eggs and larvae, through the Delta and into Suisun and San Francisco bays. Flows from February through June play an especially important role in determining the reproductive success and survival of many estuarine species including salmon, striped bass, American shad, delta smelt, longfin smelt, splittail, and others (Stevens and Miller, 1983; Stevens et al., 1985; Meng and Herbold, 1994; Meng and Moyle, 1995). Delta outflow also has a significant influence on the geographic location of the low salinity zone within the estuary. One important indicator that is used to assess estuarine habitat conditions is the location of the salinity condition that is commonly referred to as the X2 location (defined as the 2 parts per thousand salinity isohaline). Results of fishery monitoring over a number of years within the estuary have shown that the survival and abundance of the juvenile lifestages of a number of fish and macroinvertebrate species typically increases when Delta outflows are high and the X2 location is within Suisun Bay during the late winter and spring. A reduction in Delta outflow or an easterly movement of the X2 location during the winter and spring (February through June) is used as one indicator of a project's potential negative effects on estuarine habitat conditions.

Long-term average results of the comparison of net Delta outflow under 2005 level of development with and without each of the project alternatives are shown for reference in **Table 4.3-11**; the monthly average values by water year type that were the basis for the analysis are presented in Appendix C-7. For purposes of evaluating the potential effect of changes in Delta outflow on fishery habitat within the Bay-Delta estuary, and considering the accuracy and inherent "noise" within the hydrologic model, changes in the average monthly flows modeled under project alternatives that were within 5 percent (+ or -) of the Existing Condition would not be expected to result in a detectable effect on habitat quality or availability, or affect the transport mechanisms provided by net Delta outflow, which may influence resident or migratory fish or the zooplankton and phytoplankton that they rely on for a food resource. In general, changes were found to be far smaller than 5 percent, as shown in Table 4.3-11 and in the results presented in Appendix C-7.

TABLE 4.3-9
LONG-TERM MONTHLY AVERAGE OF SAN JOAQUIN RIVER AT VERNALIS UNDER 2005 LEVEL OF DEVELOPMENT

San Joaquin River Flow at Vernalis (cfs) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		2,547	2,731	3,484	4,857	6,598	6,478	6,022	6,065	4,681	3,244	2,129	2,570
Percent Change from Existing Condition	Alt 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		2,548	2,731	3,484	4,857	6,595	6,478	6,023	6,066	4,684	3,247	2,131	2,571
Percent Change from Existing Condition	Alt 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

TABLE 4.3-10
LONG-TERM MONTHLY AVERAGE OF SAN JOAQUIN RIVER AT VERNALIS UNDER 2030 LEVEL OF DEVELOPMENT

San Joaquin River Flow at Vernalis (cfs) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		2,533	2,703	3,447	4,824	6,506	6,339	5,990	6,040	4,619	3,236	2,097	2,569
Percent Change from Future Without Project	Alt 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		2,534	2,704	3,447	4,824	6,503	6,340	5,991	6,041	4,621	3,239	2,099	2,570
Percent Change from Future Without Project	Alt 1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Alt 4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

TABLE 4.3-11
LONG-TERM MONTHLY AVERAGE OF DELTA OUTFLOW UNDER 2005 LEVEL OF DEVELOPMENT

Delta Outflow (cfs) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		5,161	9,743	24,095	43,797	55,745	46,645	29,756	22,275	14,065	8,116	4,652	5,488
Percent Change from Existing Condition	Alt 1	-0.8%	-0.6%	-0.3%	0.0%	-0.1%	-0.1%	0.5%	-1.4%	-0.2%	0.4%	-0.6%	-0.6%
	Alt 2	-1.4%	-1.1%	-0.6%	-0.1%	-0.2%	-0.2%	0.5%	-1.5%	-0.3%	0.5%	-0.5%	-0.7%
	Alt 3	-0.6%	-0.1%	-0.5%	-0.3%	0.0%	-0.1%	0.0%	-0.6%	0.3%	-0.2%	-0.1%	0.2%
	Alt 4	-0.1%	0.1%	-0.1%	-0.2%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.1%	-0.2%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		5,216	9,457	23,899	43,760	54,987	44,781	29,264	21,649	13,342	8,461	4,492	5,456
Percent Change from Existing Condition	Alt 1	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.1%	0.3%	-1.4%	0.2%	0.2%	-0.7%	-0.3%
	Alt 2	-1.3%	-0.8%	-0.5%	-0.5%	-0.2%	-0.2%	0.3%	-1.5%	0.2%	0.3%	-0.9%	-0.4%
	Alt 3	-0.1%	0.3%	0.0%	-0.4%	-0.3%	-0.3%	0.0%	-0.6%	0.4%	-0.2%	0.0%	0.2%
	Alt 4	0.3%	-0.2%	0.0%	-0.2%	-0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	-0.1%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

As shown in Appendix C-7, Delta outflow under 2005 level of development varied in years of different water year type, reflecting variation in Central Valley hydrology under both the Existing Condition and each of the project alternatives. Variation attributable to the project between the Existing Condition and each of the project alternatives is generally less than 1 percent, and did not exceed 5 percent for Alternatives 1, 2, and 4.

As shown in Appendix C-7, analysis of Alternative 3 indicates a long-term average monthly reduction in Delta outflow of about 6 percent in critical water years in February under the 2005 level of development with moderate fishery restrictions; average February Delta outflow for critical water years in the Existing Condition is 14,890 cfs and is reduced about 900 cfs in Alternative 3. However, upon closer examination, this reduction was found to be due to an anomaly in one month when the model reduced Delta outflow in Alternative 3 by about 7,500 cfs from the Existing Condition. This particular instance represents an artifact of the model tools used in these analyses, and is not representative of the effects of the project alternative (see discussion of step functions in CalSim II in Section 4.2 for more information on this type of artifact). Results of this analysis indicate that all of the project alternatives would result in less than significant incremental effects on fishery habitat as a consequence of changes in Delta outflow under the 2005 level of development.

Long-term average net Delta outflow under 2030 level of development with and without each of the project alternatives is shown for reference in **Table 4.3-12**; the monthly average values by water year type that were the basis for the analysis are presented in Appendix C-7. As discussed in the 2005 level of development above, Delta outflows under many of the project alternatives were observed to be both slightly lower and slightly higher compared to the Future Without Project

TABLE 4.3-12
LONG-TERM MONTHLY AVERAGE OF DELTA OUTFLOW UNDER 2030 LEVEL OF DEVELOPMENT

Delta Outflow (cfs) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		4,891	9,389	24,113	43,838	55,898	46,668	29,842	22,122	13,826	8,100	4,549	5,105
Percent Change from Future Without Project	Alt 1	-0.7%	-0.2%	-0.1%	0.0%	-0.2%	-0.2%	0.3%	-1.5%	-0.1%	0.4%	-0.5%	-0.4%
	Alt 2	-0.8%	-1.5%	-0.6%	-0.1%	-0.3%	-0.3%	0.4%	-1.6%	0.0%	0.4%	-0.6%	-0.4%
	Alt 3	0.1%	-0.2%	-0.3%	-0.1%	-0.3%	-0.3%	0.0%	-0.8%	0.3%	-0.5%	0.3%	0.0%
	Alt 4	0.0%	-0.3%	0.0%	0.2%	-0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.1%	-0.2%

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		4,862	8,956	23,572	43,380	54,586	44,657	29,250	21,550	13,153	8,514	4,436	5,146
Percent Change from Future Without Project	Alt 1	-0.3%	-0.1%	-0.1%	0.3%	0.0%	-0.3%	0.3%	-1.6%	0.0%	0.0%	-0.4%	-0.2%
	Alt 2	-0.6%	-0.5%	-0.6%	0.0%	-0.1%	-0.3%	0.2%	-1.6%	0.0%	0.0%	-0.5%	-0.2%
	Alt 3	0.3%	-0.1%	-0.2%	-0.1%	-0.3%	-0.5%	0.1%	-0.9%	0.0%	-0.1%	0.1%	0.3%
	Alt 4	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%

% = percent
Alt = alternative
cfs = cubic foot (feet) per second

conditions depending on month and water year type. The long-term monthly average percent change of net Delta outflow between the alternatives and the Future Without Project is generally less than 1 percent, and never exceeds 5 percent for Alternatives 1 and 4 for any water year type.

Alternative 2 indicates an average reduction in Delta outflow of about 5 percent in above normal water years in November under 2030 level of development with severe fishery restrictions; average November Delta outflow for above normal water years in the Future Without Project is 9,919 cfs and is reduced about 330 cfs in Alternative 2. This reduction in above normal water years in November would not have a significant impact on fishery habitat.

As shown in Appendix C-7, Alternative 3 indicates an average reduction in Delta outflow of about 10 percent in critical water years in December under 2030 level of development with severe fishery restrictions; average December Delta outflow for critical water years in the Future Without Project is 5,661 cfs and is reduced about 580 cfs in Alternative 3. However, this reduction was found to be due to an anomaly in one month when the model reduced Delta outflow in Alternative 3 by about 6,200 cfs from the Future Without Project. This instance is an artifact of the model tools used in these analyses, and is not representative of the effects of the project alternative (see discussion of step functions in CalSim II in Section 4.2 for more information on this type of artifact).

The results of this comparison show that all of the project alternatives would have a less than significant incremental effect on fishery habitat and hydrologic transport processes within the Bay-Delta estuary.

Low Salinity Habitat and Location of X2. Salinity is an important factor affecting habitat quality and availability for fish and macroinvertebrates inhabiting the Delta and Suisun Bay. All estuarine species have optimal salinity ranges, and their survival may be affected by the amount of habitat available within the species' optimal salinity range. Because the location of the salinity field in the Delta and Suisun Bay is largely controlled by freshwater outflows, the level of outflow may determine the surface area of optimal salinity habitat that is available to a species (Hieb and Baxter, 1993; Unger, 1994).

The transition area between saline waters within San Francisco Bay and freshwater within the rivers, frequently referred to as the low salinity zone, is within Suisun Bay and the western Delta. The low salinity zone has also been associated with the entrapment zone, a region of the estuary characterized by higher levels of particulates, higher abundances of several types of organisms, and a turbidity maximum. It is commonly associated with the specific position of X2, the 2 parts per thousand isohaline, but actually occurs over a broader range of salinities (Kimmerer, 1992). Originally, the primary mechanism responsible for this region was thought to be gravitational circulation, a circulation pattern formed when freshwater flows seaward over a dense, landward-flowing marine tidal current. However, recent studies have shown that gravitational circulation does not occur in the entrapment zone in all years, nor is it always associated with X2 (Burau et al., 1998). Lateral circulation within the Delta and Suisun Bay or chemical flocculation may play a role in the formation of the turbidity maximum of the entrapment zone.

Although recent evidence indicates that the location of X2 and the entrapment zone are not as closely related as previously believed (Burau et al., 1995), X2 continues to be used as an index of the location of the area of increased biological productivity. Historically, X2 has varied between San Pablo Bay (River kilometer [km] 50), measured upstream from the Golden Gate Bridge) during periods of high Delta outflow and Rio Vista (River km 100) during periods of very low Delta outflow. In recent years, X2 has typically been between about Honker Bay and Sherman Island (River km 70 to River km 85). The location of X2 is managed, in part, by Delta inflow and releases from upstream reservoirs during the February through May period each year as required by the SWRCB D-1641. X2 location is controlled directly by the volume of Delta outflow, although changes in X2 location lag behind changes in outflow. Minor modifications in outflow do not greatly alter X2.

Jassby et al. (1995) observed that when X2 is in the vicinity of Suisun Bay, several estuarine organisms tend to show increased abundance. However, it is not certain that X2 has a direct effect on any of the species. The observed correlations may result from a close relationship between X2 and other factors that affect these species. Studies and analyses are continuing to better define and understand the relationships between X2/Delta outflow and the production and survival (abundance) of various species of fish and macroinvertebrates inhabiting the Delta and Suisun Bay.

For purposes of evaluating changes in habitat quantity and quality for estuarine species, a significance criterion of an upstream change in X2 location within 1 km of the without project condition was considered to be less than significant. The 1 km X2 criterion used in this analysis was derived from the criterion applied to the environmental analysis of the Environmental Water Account (Reclamation and DWR, 2003). The criterion was applied to a comparison of hydrologic model results between the without project condition and each of the project alternatives, using a long-term monthly average by water year type.

Long-term average changes in X2 position are shown in **Table 4.3-13** and **Table 4.3-14.** Changes in X2 position averaged by water year type, shown in Appendix C-7, never exceed 0.75 km with both variable upstream and downstream movement of the X2 location depending on month and water year type. These results are consistent with model results for Delta outflow, described above, that also showed a less than significant change. Results of these analyses show that the impacts of changes in hydrologic conditions affecting X2 location under each of the project alternatives would be less than significant.

Export-to-Inflow Ratio. The E/I ratio, which is the percentage of Delta inflow exported from the Sacramento and San Joaquin river systems and the Delta by SWP and CVP facilities in the south Delta, provides an indicator of several key ecological processes, including: (1) migration and transport of various lifestages of resident and anadromous fishes using the Delta; (2) salinity levels at various locations within the Delta as measured by the locations of X2; and (3) the risk of direct and indirect fish losses resulting from export operations. Although no specific biological relationships have been developed regarding the abundance of various fish and macroinvertebrate species and the E/I ratio, the ratio is used in SWRCB D-1641 as one of the bases for regulating the rate of freshwater exports from the Delta. The E/I ratio reflects the balance between freshwater inflows to the Delta and the corresponding percentage of inflows that can be exported through the SWP and CVP diversion facilities. The maximum allowable E/I ratio varies with the season of the year; the E/I ratio is limited to 35 percent during the February-June period when juvenile fish are most vulnerable to losses resulting from diversions and increases to 65 percent during the remainder of the year. The E/I ratio represents a tool for reducing the effects of diversion operations from the SWP and CVP on resident and migratory fish inhabiting the estuary. If the E/I ratio is close to the regulatory limit, then additional increase in the E/I ratio, indicating greater exports from the Delta relative to the inflow of freshwater from the tributary rivers, would generally be interpreted as an increase in the potential risk of adverse effects on fishery resources and their habitat resulting from entrainment and salvage at the SWP and CVP export facilities.

As discussed in Chapter 3, Alternatives 1 and 2 shift a portion of the South Bay water agencies' Delta diversions to the expanded Los Vaqueros system, which provides improved fish screening, a No-Diversion Period, and multiple intake locations to better protect Delta fish. For the purpose of the E/I ratio analysis, this shifted water supply is still counted as exports, such that the E/I ratio is not changed simply by shifting the diversions to the expanded Los Vaqueros system.

Results for the E/I ratio under 2005 level of development and 2030 level of development are presented in **Table 4.3-15** and **Table 4.3-16,** respectively. As shown, between January and June the E/I ratio is substantially less than the regulatory limit for this parameter. This is due to the fishery restrictions assumed in these analyses, which reduce exports but do not reduce inflow

TABLE 4.3-13
LONG-TERM MONTHLY AVERAGE OF X2 LOCATION UNDER 2005 LEVEL OF DEVELOPMENT

X2 Location (previous month) (km) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		85	85	82	77	70	64	63	66	69	74	78	83
Change from Existing Condition	Alt 1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Alt 2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Alt 3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Alt 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		85	85	83	77	70	64	64	67	70	75	78	84
Change from Existing Condition	Alt 1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
	Alt 2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.1
	Alt 3	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
	Alt 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alt = alternative
km = kilometer
X2 = 2 parts per thousand salinity isohaline

TABLE 4.3-14
LONG-TERM MONTHLY AVERAGE OF X2 LOCATION UNDER 2030 LEVEL OF DEVELOPMENT

X2 Location (previous month) (km) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		86	86	83	77	70	64	63	66	69	74	78	84
Change from Future Without Project	Alt 1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Alt 2	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Alt 3	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Alt 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		86	86	83	77	70	64	64	67	70	75	78	84
Change from Future Without Project	Alt 1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0
	Alt 2	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
	Alt 3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0
	Alt 4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alt = alternative
km = kilometer
X2 = 2 parts per thousand salinity isohaline

TABLE 4.3-15
LONG-TERM MONTHLY AVERAGE OF EXPORT TO INFLOW RATIO UNDER 2005 LEVEL OF DEVELOPMENT

Export/Inflow Ratio (%) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		57	52	42	27	14	9	8	10	10	41	54	57
Change from Existing Condition	Alt 1	0.1	0.0	0.1	0.1	0.0	0.0	-0.5	0.0	-0.1	-0.3	-0.1	0.0
	Alt 2	0.1	0.0	0.0	-0.2	0.0	0.0	-0.5	0.0	-0.1	-0.3	-0.1	0.0
	Alt 3	0.2	0.1	0.5	0.5	0.1	0.1	0.0	0.0	0.0	-0.2	0.0	0.3
	Alt 4	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		57	53	41	27	15	15	11	14	21	38	53	57
Change from Existing Condition	Alt 1	0.2	0.2	0.1	0.3	0.0	0.0	-0.6	-0.1	0.0	-0.2	-0.2	0.0
	Alt 2	0.2	0.1	0.1	0.5	0.0	0.0	-0.6	-0.2	-0.1	-0.4	-0.2	0.0
	Alt 3	0.3	0.1	0.4	0.8	0.4	0.3	0.1	0.0	0.1	-0.2	-0.5	0.4
	Alt 4	0.1	0.1	0.0	0.4	0.0	0.1	0.0	0.0	0.0	-0.1	-0.4	0.1

% = percent
Alt = alternative

TABLE 4.3-16
LONG-TERM MONTHLY AVERAGE OF EXPORT TO INFLOW RATIO UNDER 2030 LEVEL OF DEVELOPMENT

Export/Inflow Ratio (%) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		56	52	41	27	13	8	8	10	10	42	55	57
Change from Future Without Project	Alt 1	0.2	0.1	-0.2	-0.3	0.1	0.0	-0.4	-0.1	0.0	-0.3	-0.1	0.1
	Alt 2	0.1	0.3	0.0	-0.3	0.1	0.0	-0.4	-0.1	-0.1	-0.2	-0.1	0.1
	Alt 3	0.3	0.3	0.6	0.3	0.3	0.3	0.1	0.0	0.0	-0.3	-0.3	0.4
	Alt 4	0.0	0.2	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		57	54	41	27	16	15	11	14	21	39	54	58
Change from Future Without Project	Alt 1	0.1	0.2	0.1	-0.5	0.0	0.0	-0.4	-0.1	0.1	0.0	-0.1	0.0
	Alt 2	0.1	0.2	0.1	-0.4	0.0	0.0	-0.4	-0.1	0.0	-0.2	-0.1	0.1
	Alt 3	0.4	0.4	0.4	0.2	0.3	0.4	0.1	0.1	0.3	-0.4	-0.4	0.5
	Alt 4	0.0	0.1	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0

% = percent
Alt = alternative

when surplus water is available in the Delta. Changes in E/I ratio under all project alternatives are not substantial and would likely not result in a significant reduction in the quality or quantity of aquatic habitat within the estuary, or the risk of entrainment and salvage mortality at the water export facilities.

Alternatives 1 and 2 reduce the E/I ratio in April, which could potentially benefit fishery resources. This benefit is created by providing water supply to South Bay water agencies from storage in the expanded Los Vaqueros Reservoir during the 30-day No-Diversion Period, as described in Chapter 3, and thereby reducing total Delta diversions during this period.

Effects of changes in circulation within the Delta

Particle tracking model. The particle tracking model (PTM) estimates the probability that a parcel of water starting at one location will arrive at another location in a given time frame. The PTM tool has been used to assess the potential effects of water project operations on planktonic phytoplankton (microscopic free-floating aquatic plants) and zooplankton (free-floating aquatic invertebrates) that are important as a food resource within the estuary. Because the particles simulated in the model are neutrally buoyant (and therefore have no swimming behavior or other independent movement) results of these analyses are most relevant to the planktonic early larval stages of various organisms that do not move independently in the water column. The particles are not considered to reflect movements of juvenile or adult fish within the Delta.

For this analysis, particle releases were simulated in the model at various locations within the Delta that are either known to represent important fish habitat or important hydrologic locations. Such simulated particle releases were made in each month of the 16-year Delta hydrodynamic model study period (see discussion of the DSM2 model in Section 4.2). After each release, particles were tracked in the simulated Delta conditions for 120 days and counted when they entered an export facility or other diversion or when they exited the geographic extent of the model by passing Martinez downstream of Suisun Bay. The percentage of particles shown by the model to remain in Suisun Bay and Marsh and within the Delta was analyzed for each geographic region. This analysis was repeated for each simulated particle release.

In general, the following considerations should be taken into account when interpreting the particle tracking analysis (a more detailed description of PTM methodology and limitations is provided in Appendix C-7):

- The measure of changes in Delta circulation patterns provided by the analysis is most relevant for passive entities such as planktonic species and larval stage fish that have no swimming behavior or otherwise independent means of movement.

- The PTM tool does not account for fish screens. Positive barrier fish screens provide proven entrainment reductions even for larval stage fish, which are hatched at sizes at the low end of the size exclusion range of the screens. One important finding of the PTM analysis was that particles that would be excluded by the screens do have the possibility of leaving the Delta, especially in the spring, so particles that are transported to the central Delta are not necessarily trapped in the Delta. Incorporating a screen efficiency factor that reduces entrainment and leaves more particles in the flow field would effectively increase the percentage of particles traveling past Chipps Island.

- PTM has limitations regarding the dispersion of particles (Kimmerer and Nobriga, 2008), including simplistic assumed velocity profiles that do not adjust for channel geometry or bottom roughness, and the mixing of particles at channel nodes. These factors may have a significant effect on particle dispersion, particularly in the near-field (locations close to where the particles are released). Dispersion issues in the near-field are amplified in the central and south Delta due to the DSM2 channel grid, where nodes are very close together. Additionally, because agricultural diversions are simulated at almost every DSM2 node in the central and south Delta, simulated particle releases in this region are likely to contain errors in the estimation of agricultural entrainment that are due to the near-field dispersion issue.

- The open, shallow water areas of the Delta (e.g., Franks Tract and Mildred Island) are not well represented in the particle tracking analysis. The model assumes the regions are completely mixed environments, such that a particle that enters on one side of the flooded lake has the possibility of exiting on the other side of the lake in a short time period. In reality, these environments have complicated dynamics that effectively “trap” particles within the regions or can move them in ways that the model does not capture.

To illustrate changes in Delta circulation provided by the particle tracking simulation, results are shown for a select location – Chipps Island, which represents the western boundary of the Delta – for the 2030 level of development with severe fishery restrictions, which includes the greatest incremental change due to the project alternatives. Additional results are provided in Appendix C-7. **Table 4.3-17** shows the percentage of neutrally buoyant particles that are modeled to have traveled past Chipps Island 120 days after the particles originated at the specified release locations. The three leftmost numeric columns of each table show the average percentage of particles that pass Chipps Island for the without-project condition during Winter (December through February), Spring (March through June), and Fall (September through November). The remaining columns show the change from the without project condition in percentage of particles that have traveled past Chipps Island for each season.

In general, the percentage of particles passing Chipps Island tends to be greatest for particles originating in the western Delta or upstream on the Sacramento River. Particles originating in the central and southern Delta have a lower probability of passing Chipps Island, yet, in the without-project conditions under severe fishery restrictions, about 45 percent of the particles originating in the spring on Old River near Holland Tract do pass Chipps Island within 120 days after release.

Changes in particle fate between the alternatives under 2030 level of development and the Future Without Project conditions were assessed. In all scenarios, small decreases occur in particles passing Chipps Island, mostly in the range of 1 to 2 percent; this is consistent with the small change in Delta outflow discussed above.

TABLE 4.3-17
LONG-TERM, SEASONAL AVERAGE PERCENT OF PARTICLES TRAVELING PAST CHIPPS ISLAND 120 DAYS AFTER PARTICLES ARE RELEASED AT DESIGNATED LOCATIONS 2030 LEVEL OF DEVELOPMENT; SEVERE FISHERY RESTRICTIONS

	Future Without Project			Change from Future Without Project											
				Alt 1			Alt 2			Alt 3			Alt 4		
Release Location	W	S	F	W	S	F	W	S	F	W	S	F	W	S	F
Sacramento River at Freeport	68	73	37	0	-1	0	0	-1	0	-1	0	0	0	0	0
Sacramento River above Delta Cross Channel	63	73	31	-1	-1	0	-1	-2	0	-1	0	0	0	0	0
Cache Slough at Sac Ship Channel	47	11	16	0	0	0	0	0	0	0	0	0	0	0	0
Sacramento River at Rio Vista	79	83	56	0	0	0	0	-1	0	0	0	0	0	0	0
Sacramento River at Emmaton	84	87	67	0	0	0	0	0	-1	0	0	0	0	0	0
Sacramento River at Collinsville	88	91	79	0	0	0	0	0	0	0	0	0	0	0	0
San Joaquin River at Jersey Island	77	84	53	0	0	0	-1	-1	0	-1	0	0	0	0	1
San Joaquin River at mouth of Old River	50	68	19	-1	-1	0	-2	-2	0	-1	1	0	0	0	0
Old River at Holland Tract	23	45	3	0	-4	0	-1	-5	0	0	0	0	0	1	0
Middle River at Empire Cut	10	17	0	0	-1	0	0	-1	0	0	-1	0	0	0	0
San Joaquin River west of Rough and Ready Island	25	38	3	-1	-2	0	-1	-2	0	-1	-1	0	-1	0	0
San Joaquin River at Mossdale	14	20	2	0	-1	0	-1	-1	0	0	0	0	0	0	0
Suisun Bay at Port Chicago	-2	-1	-5	0	0	0	0	0	0	0	0	0	0	0	0
Montezuma Slough	-1	0	4	0	0	0	0	0	0	0	0	0	0	0	0

Seasonal averages:
W = Winter (December through February), S = Spring (March through June), and F = Fall (September through November)

The greatest reduction in the percent of particles passing Chipps Island occurs in the spring for particles originating on Old River at Holland Tract, with a maximum decrease of 4 to 5 percent occurring in the 2030 level of development under severe fisheries restrictions for Alternatives 1 and 2. To determine whether a 4 to 5 percent reduction would significantly affect Delta fisheries and other aquatic resources, the following additional information regarding particles originating on Old River at Holland Tract under the Future Without Project condition under severe fishery restrictions should be considered:

- As indicated in Table 4.3-17, on average in the without project condition, 45 percent of particles released in the spring pass Chipps Island within 120 days. The variability around the average is characterized by the standard deviation. For the same time period, the standard deviation is 28 percent, indicating that a reduction of 4 to 5 percent in Alternatives 1 and 2 in comparison to the without project condition is a small fraction of the variability in the without project condition.

- On average in the without project condition, 25 percent of particles originating on Old River at Holland Tract are entrained into agricultural diversions. In Alternatives 1 and 2, this increases to 30 percent – an increase of 5 percent, which corresponds to the reduction in particles passing Chipps Island. Alternatives 1 and 2 do not increase or otherwise alter agricultural diversions; the 5 percent increase in particles entrained in the agricultural diversions appears to be an artifact of the modeling, and does not directly result from the operation of the project alternatives.

Overall, the particle tracking results presented in Table 4.3-17 indicate no significant changes in particle behavior between the Future Without Project and each of the 2030 level of development project alternatives under severe fishery restrictions, with respect to their movement through the Delta. These results are representative of the particle tracking studies analyzed for the project alternatives (see Appendix C-7 for additional results), and they support the conclusion that the project alternatives do not create adverse impacts related to changes in hydrologic conditions in terms of Delta circulation.

Qwest. Qwest is a measure of the net flow in the lower San Joaquin River near Sherman Island. Flows in this region are strongly tidal, and the net (i.e., tidally averaged) flow is generally less than 5 percent of the peak flow rate. For instance, flows in the San Joaquin River at Jersey Point generally vary tidally between +150,000 cfs and -150,000 cfs, while net flow is generally between +10,000 cfs and -5,000 cfs.

A condition described as “reverse flows” as measured by the Qwest parameter occurs when Delta diversions and agricultural demands in the south and central Delta exceed the inflow into the central Delta, such that net flow on the lower San Joaquin River is to the east. Inflow into the central Delta is composed of San Joaquin River inflow, Sacramento River flow through the Delta Cross Channel, Georgiana Slough, and Three Mile Slough, and flows from rivers along the eastern side of the Delta, including the Mokelumne, Consumnes and Calaveras rivers.

Eastward flow on the lower San Joaquin River is measured as a negative value of the Qwest parameter. This condition occurs frequently during dry years with low Delta inflows and high levels of export at the SWP and CVP facilities in the south Delta. Net reverse flows are particularly common during summer and fall when nearly all exported water is drawn across the Delta from the Sacramento River (DWR and Reclamation, 1994). The Qwest parameter has been hypothesized to be correlated with fish abundance in the Delta, such that negative values of Qwest could indicate greater potential for fish entrainment at Delta export facilities. Analysis of model and historical data to date has not conclusively shown such a relationship. However, the effects of project alternatives on Qwest is provided here for reference, and to more completely describe the project effects on the aquatic environment of the Delta.

As shown in **Table 4.3-18** and **Table 4.3-19,** modeled estimates of net reverse flow conditions on the lower San Joaquin River (i.e., negative values for Qwest) occur in the existing and future without project conditions primarily from July through November. In dry and critical water years, net reverse flows often extend into December and January (see Appendix C-7 for monthly averages by water year type).

TABLE 4.3-18
LONG-TERM MONTHLY AVERAGE OF QWEST UNDER 2005 LEVEL OF DEVELOPMENT

Qwest (cfs) under 2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		-951	-929	1,444	6,043	9,716	9,830	8,124	6,523	5,183	-1,242	-2,906	-1,542
Change from Existing Condition	Alt 1	-29	-29	-41	-24	-38	-63	169	-348	-79	-19	10	-19
	Alt 2	-55	-73	-109	-40	-94	-95	165	-360	-99	-47	-1	-14
	Alt 3	-13	-6	-86	-112	-10	-39	13	-122	80	-39	-2	-61
	Alt 4	-2	10	-10	-68	-9	-2	22	8	-5	-5	-9	-14

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		-1,054	-1,104	1,401	6,072	8,978	7,904	7,600	5,906	3,637	-610	-2,648	-1,573
Change from Existing Condition	Alt 1	-37	-26	-46	-104	-9	-82	170	-368	-17	-11	30	4
	Alt 2	-59	-74	-145	-205	-59	-147	164	-380	-36	-11	16	-8
	Alt 3	-16	2	-65	-174	-67	-190	2	-131	131	-39	64	-77
	Alt 4	-14	-8	-4	-77	-8	-37	5	8	-2	9	40	-22

Alt = alternative
cfs = cubic foot (feet) per second
QWEST = Parameter that represents the estimated net westward flow of the San Joaquin River at Jersey Point

TABLE 4.3-19
LONG-TERM MONTHLY AVERAGE OF QWEST UNDER 2030 LEVEL OF DEVELOPMENT

Qwest (cfs) under 2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		-754	-1,082	1,506	5,989	9,768	9,802	8,083	6,400	5,081	-1,460	-3,002	-1,498
Change from Future Without Project	Alt 1	-25	-30	22	47	-58	-125	147	-366	-85	-70	-3	-9
	Alt 2	-35	-83	-108	-9	-126	-137	144	-379	-97	-92	-10	-5
	Alt 3	-3	-6	-43	-15	-151	-178	2	-150	86	-32	21	-47
	Alt 4	1	-3	-2	117	-28	-13	11	7	7	-27	-20	-8

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		-974	-1,234	1,390	5,924	8,750	7,819	7,504	5,765	3,538	-1,016	-2,982	-1,656
Change from Future Without Project	Alt 1	-11	-25	-42	141	-17	-144	157	-393	-23	-15	19	7
	Alt 2	-23	-58	-120	13	-56	-174	135	-403	-39	-19	4	-1
	Alt 3	-17	-70	-62	-33	-106	-259	2	-160	114	-17	25	-88
	Alt 4	1	1	4	72	-8	-19	14	9	7	-14	-12	3

Alt = alternative
cfs = cubic foot (feet) per second
QWEST = Parameter that represents the estimated net westward flow of the San Joaquin River at Jersey Point

For Alternatives 1 and 2, the maximum incremental decreases in Qwest tend to occur in May, when Qwest values are generally positive and typically exceed 5,000 cfs. Thus, the effect of a decrease during that time is not significant. This is a result of the focus of the project alternatives on use of surplus flows, as described in Section 4.2, which generally means that Qwest is positive when the use of the surplus flows (which cause the resultant Qwest decrease) occurs. The effect of the No-Diversion Period is evident in Alternatives 1 and 2 in April, when Qwest flows are consistently made more positive. During the periods when Qwest is reversed (from July through November), the Qwest decreases caused by project operations are small and would not cause significant changes in habitat. The effects of Alternative 3 on Qwest are generally smaller than those of Alternatives 1 and 2. Similar to Alternatives 1 and 2, the greatest reductions in Qwest occur during times of ample Qwest flow. Alternative 4 has the smallest effects on Qwest of all the alternatives. Results of these analyses show that the impacts of changes in hydrologic conditions affecting Qwest under each of the project alternatives would be less than significant.

Old and Middle Rivers. The reference net flow in Old and Middle Rivers is normally defined to be in the northerly direction, i.e. towards San Francisco Bay. A net reverse flow condition can occur within Old and Middle Rivers as the rate of water exported at the SWP and CVP export facilities exceeds tidal and downstream flows within the central region of the Delta. This condition would be represented by a negative value of net flow in Old and Middle rivers. There have been concerns regarding the effects of net reverse flows on fish populations and their food supply, as well as the effects of net reverse flows on delta smelt salvage (DWR and Reclamation, 1994). Net reverse flows in Old and Middle rivers, resulting from low San Joaquin River inflows and increased exports at the SWP and CVP facilities in the south Delta, have been identified as a potential cause of increased delta smelt take at the SWP and CVP fish facilities (Simi and Ruhl, 2005; Ruhl et al., 2006). Analyses of the relationship between the magnitude of net reverse flows in Old and Middle Rivers and salvage of adult delta smelt in the winter shows a substantial increase in salvage as net reverse flows exceed about -5,000 cfs (meaning the net flow is more negative than -5,000 cfs). Concerns regarding net reverse flows in Old and Middle River have also focused on planktonic egg and larval stages of striped bass, splittail, and on chinook salmon smolts, in addition to delta smelt, and while these species do not spawn to a significant extent in the southern Delta, eggs and larvae may be transported into the area. As discussed previously, these early life stages are generally entrained by the CVP and SWP export pumps, since they are too small to be effectively screened.

The most biologically sensitive period when the potential effects of net reverse flows could affect delta smelt, chinook salmon, and many other species extends from the late winter through early summer (December through June). Generally, increases in net flow during this time period may be considered beneficial while decreases to net flow indicate potential adverse effects. However, the extent of the benefit or adverse effect depends on the magnitude of the net flow. For instance, as mentioned above, salvage of delta smelt at the export facilities increases substantially as net reverse flows in Old and Middle River exceed -5,000 cfs. Therefore, an incremental decrease (relative to the without project condition) in net flow when net flow in the without project condition is near -5,000 cfs could be potentially adverse, while an incremental increase could be beneficial. On the other hand, if net flow in the without project condition is greater (meaning more northward) than -3,000 cfs, an incremental change may not have a significant effect (either beneficial or adverse).

Modeling for the project alternatives includes constraints on export diversions at the SWP Banks and CVP Jones pumping facilities to meet reverse flow requirements in the Old and Middle rivers that are similar to those specified in the *NRDC vs. Kempthorne* interim remedies order. Since the Common Assumptions effort has not yet developed a standard constraint equation for Old and Middle River flows, the Common Assumptions version of the CalSim II model was revised to include scenarios for moderate and severe fishery restrictions in the Delta (see Appendix C-3); net flow in Old and Middle rivers in CalSim II was estimated using the flow in the San Joaquin River at Vernalis, pumping at the SWP Banks and CVP Jones pumping facilities, and the portion of the pumping at the Los Vaqueros intakes that had been shifted from SWP and CVP facilities for the South Bay water agencies (Alternative 1 and Alternative 2). The constraints on export diversions at SWP Banks and CVP Jones pumping facilities to meet Old and Middle River flow requirements did not include the portion of pumping at the Los Vaqueros intakes that is used to meet CCWD demand and other project benefits (including Delta Supply Restoration in Alternative 1 and Dedicated Storage for Environmental Water in Alternative 2), either through direct diversion or diversion to storage.

To determine the effects of all project diversions, the DSM2 Delta hydrodynamics model calculates flows in Old and Middle Rivers based upon all simulated boundary flows and diversions, including all diversions at the Los Vaqueros intakes. To provide context with respect to operational restrictions implemented by the *NRDC vs. Kempthorne* interim remedies order to protect delta smelt as of December 2007, Old and Middle River net flow was calculated using simulated tidal flows (as determined by DSM2 modeling) on Old and Middle River near the locations referred to within the court documents. **Table 4.3-20** and **Table 4.3-21** presents a summary of the results for the 2005 and 2030 level of development, respectively, with additional results presented in Appendix C-7. Incremental changes to Old and Middle River net flow are reflective of modifications in the diversions at Delta water intakes, or changes in releases from upstream reservoirs, such as Shasta, Folsom and Oroville.

TABLE 4.3-20
LONG-TERM MONTHLY AVERAGE OF OLD AND MIDDLE RIVER NET FLOW USING DELTA FLOW MODEL (DSM2) UNDER 2005 LEVEL OF DEVELOPMENT

Old and Middle River Net Flow
Long-term Monthly Average of Tidally Filtered Simulated Values (cfs)
2005 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		-7,189	-6,839	-6,274	-3,615	-1,043	1,127	653	-225	-963	-6,373	-7,684	-7,102
Change from Existing Condition	Alt 1	-72	44	-30	-4	-10	-135	141	-179	-42	-18	24	-20
	Alt 2	-93	-1	-59	-18	-47	-171	136	-194	-57	-38	33	-15
	Alt 3	-23	51	-77	20	10	-90	-8	-69	85	-35	-13	-118
	Alt 4	4	26	-62	-52	9	-1	24	3	0	1	1	-1

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Existing Condition		-7,188	-6,830	-6,249	-3,925	-1,305	-356	192	-833	-2,513	-5,831	-7,253	-7,129
Change from Existing Condition	Alt 1	-143	-61	-43	56	13	-128	162	-204	-15	2	175	38
	Alt 2	-91	-86	-54	-84	-32	-169	143	-202	-31	55	97	1
	Alt 3	-235	3	-38	4	-34	-146	36	-44	104	-141	220	-92
	Alt 4	-44	-25	16	-5	3	-8	19	16	3	-11	94	0

Alt = alternative
cfs = cubic foot (feet) per second

TABLE 4.3-21
LONG-TERM MONTHLY AVERAGE OF OLD AND MIDDLE RIVER NET FLOW USING DELTA FLOW MODEL (DSM2) UNDER 2030 LEVEL OF DEVELOPMENT

Old and Middle River Net Flow
Long-term Monthly Average of Tidally Filtered Simulated Values (cfs)
2030 Level of Development

Severe Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		-7,420	-6,842	-5,862	-3,664	-1,065	849	521	-392	-1,114	-7,183	-8,005	-6,844
Change from Future Without Project	Alt 1	-28	-44	-22	-85	-12	-136	107	-190	-72	14	45	12
	Alt 2	-27	-92	-59	-164	-45	-140	108	-204	-98	15	56	12
	Alt 3	-52	-11	-204	-186	-86	-81	-21	-99	10	4	-7	-32
	Alt 4	-9	-22	11	-19	-11	-7	14	1	1	-7	30	16

Moderate Fishery Restrictions

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Future Without Project		-7,507	-7,290	-6,130	-4,218	-1,756	-659	51	-1,007	-2,588	-6,440	-7,661	-6,880
Change from Future Without Project	Alt 1	-37	-13	-50	13	15	-132	149	-212	-56	-3	108	106
	Alt 2	-40	-40	-80	-96	-25	-135	128	-213	-66	22	34	108
	Alt 3	-25	-36	-2	-52	-29	-196	-12	-81	30	-143	31	-141
	Alt 4	16	-3	9	-1	-18	-7	14	2	-1	4	27	20

Alt = alternative
cfs = cubic foot (feet) per second

Analysis of Old and Middle River net flow indicates that the project alternatives could cause small positive and negative changes in the net flow. The changes attributable to the project alternatives are generally very small, rarely greater than 200 cfs. This level of change to net flow is below the level that would cause direct impacts to fish in the rivers. This conclusion is supported by comparing the resulting change in velocity in Old River from a 200 cfs change in Old and Middle River flow to the maximum approach velocity of 0.2 fps that is conservatively required at screened intakes in the Delta to avoid entrainment or impingement of delta smelt. Assuming a cross sectional area in Old River of about 10,000 square feet, a change in velocity in Old River from a change in Old River flow of 200 cfs would be conservatively estimated at 0.02 fps, or about one tenth of the velocity that is prescribed at intakes to ensure delta smelt protection.

Alternative 1

The analysis of incremental changes in flows upstream of the Delta, including total Delta inflow, Sacramento River at Freeport, and San Joaquin River at Vernalis, in Alternative 1 relative to without project conditions, indicates a less than significant effect on the Delta fishery. Similarly, the analysis of changes to parameters currently regulated by SWRCB D-1641 for fish and wildlife beneficial use, including net Delta outflow, the location of X2, and the E/I ratio, indicates a less than significant effect on the Delta fishery. Additionally, analysis of changes in Delta circulation as indicated by particle tracking analysis, Qwest, and net flow in Old and Middle rivers, indicates a less than significant effect on the Delta fishery.

Because each of the analyses performed to evaluate indirect effects of project operations indicated a less than significant impact on the Delta fishery, the facilities and operations under Alternative 1 would not result in significant changes in Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.

Alternative 2

The analysis of incremental changes in flows upstream of the Delta, including total Delta inflow, Sacramento River at Freeport, and San Joaquin River at Vernalis, in Alternative 2 relative to without project conditions, indicates a less than significant effect on the Delta fishery. Similarly, the analysis of changes to parameters currently regulated by SWRCB D-1641 for fish and wildlife beneficial use, including net Delta outflow, the location of X2, and the E/I ratio, indicates a less than significant effect on the Delta fishery. Additionally, analysis of changes in Delta circulation as indicated by particle tracking analysis, Qwest, and net flow in Old and Middle rivers, indicates a less than significant effect on the Delta fishery.

Because each of the analyses performed to evaluate indirect effects of project operations indicated a less than significant impact on the Delta fishery, the facilities and operations under Alternative 2 will would not result in significant changes in Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.

Alternative 3

The analysis of incremental changes in flows upstream of the Delta, including total Delta inflow, Sacramento River at Freeport, and San Joaquin River at Vernalis, in Alternative 3 relative to without project conditions, indicates a less than significant effect on the Delta fishery. Similarly, the analysis of changes to parameters currently regulated by SWRCB D-1641 for fish and wildlife beneficial use, including net Delta outflow, the location of X2, and the E/I ratio, indicates a less than significant effect on the Delta fishery. Additionally, analysis of changes in Delta circulation as indicated by particle tracking analysis, Qwest, and net flow in Old and Middle rivers, indicates a less than significant effect on the Delta fishery.

Because each of the analyses performed to evaluate indirect effects of project operations indicated a less than significant impact on the Delta fishery, the facilities and operations under Alternative 3 would not result in significant changes in Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.

Alternative 4

The analysis of incremental changes in flows upstream of the Delta, including total Delta inflow, Sacramento River at Freeport, and San Joaquin River at Vernalis, in Alternative 4 relative to without project conditions, indicates a less than significant effect on the Delta fishery. Similarly, the analysis of changes to parameters currently regulated by SWRCB D-1641 for fish and wildlife beneficial use, including net Delta outflow, the location of X2, and the E/I ratio, indicates a less than significant effect on the Delta fishery. Additionally, analysis of changes in Delta circulation as indicated by particle tracking analysis, Qwest, and net flow in Old and Middle rivers, indicates a less than significant effect on the Delta fishery.

Because each of the analyses performed to evaluate indirect effects of project operations indicated a less than significant impact on the Delta fishery, the facilities and operations under Alternative 4 would not result in significant changes in Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.

Mitigation: None required.

Impact 4.3.7: Operation of the new screened intake, or changes to diversions at existing intakes, could affect direct entrainment or impingement of fish. (Beneficial for Alternatives 1 and 2; Significant and Unavoidable for Alternative 3; Less than Significant for Alternative 4)

Three independent analyses were used to evaluate changes in the potential risk of Delta fish entrainment for each of the project alternatives, which included:

- Indices for potential entrainment based on average fish density near Delta water intakes
- Particle tracking analysis (using the DSM2 PTM tool) to assess potential entrainment for larval fish
- Indirect estimates of potential entrainment based on a flow index correlated with delta smelt salvage at the export facilities

These analyses used the same hydrologic modeling results used in evaluation of Impact 4.3.6, which describe water diversion operations over a range of environmental and hydrologic conditions (see Appendix C for full details on the modeling methodology and results). The seasonal timing and magnitude of water diversions from the Delta may affect aquatic species directly through entrainment or impingement. Hydrologic and hydrodynamic modeling results provide the technical foundation for assessing adverse effects of diversion operations on fish species and their habitats within the Bay-Delta estuary. The assessment relies on a comparative analysis of operational and resulting environmental conditions within the estuary under without-project operations and with the project alternatives (including both 2005 and 2030 levels of development).

Each of the methods presented below has specific assumptions and limitations; therefore, all methods should be examined when evaluating impacts and benefits. Detailed discussion of the methodology for each analysis and comprehensive results are contained in Appendix C-7. Summary tables of key parameters are provided below for discussion.

Entrainment Indices Based on Average Fish Density Near Delta Water Intakes

Fish entrainment indices were developed to estimate changes in entrainment potential based on comparisons of the location, timing, volume of modeled diversions at Delta intakes (when, where, and how much pumping occurs) and observed spatial and temporal patterns of fish density (when, where, and how many fish are present). The analysis used to produce the indices combined the use of intake diversion values based on hydrologic modeling with fish density estimates derived from actual regional fishery surveys that CDFG conducted within the Delta and Suisun Bay, or results of fish salvage monitoring at the SWP and CVP export facilities. The presence and effectiveness of positive barrier fish screens was also incorporated into the analysis.

The analysis produced potential entrainment indices for delta smelt, longfin smelt, striped bass, and winter-run, spring-run, fall-run, and late fall-run chinook salmon for water intakes related to the Los Vaqueros Reservoir Expansion Project, including the Old River, Rock Slough and AIP intakes, the new Delta Intake, the SWP Banks Pumping Plant and the CVP Jones Pumping Plant. Flows used in fish entrainment analyses for Alternatives 1 and 2 include CCWD direct diversions, filling of Los Vaqueros Reservoir, and Delta diversions to the South Bay Agencies, which include diversions made through Los Vaqueros facilities and diversions made at CVP and SWP Delta facilities. Flows used for the fish entrainment analyses in Alternative 3 include CCWD direct diversions, filling of Los Vaqueros Reservoir, and diversions made at Jones pumping plant from July through November to convey additional environmental water supply through the Delta to San Joaquin Valley refuges. Flows used for the fish entrainment analyses in Alternative 4 include CCWD diversions and filling of Los Vaqueros Reservoir.

The total diversions associated with each project alternative are used in this entrainment analysis, including diversions for CCWD that occur in the without project conditions and in each of the project alternatives. This is done to ensure that the effects of each project alternative are analyzed, including minor changes in timing or location of diversions for CCWD. This method allows the total entrainment index calculated for each of the project alternatives to be compared with the entrainment index calculated for the without project condition. The indices are calculated for each alternative to represent the combined entrainment potential for all intakes. For a detailed description of the methods and data used to develop the entrainment indices see Appendix C-7.

The index values are not intended to specifically represent the actual number of fish entrained, as they are based on average fish densities calculated from the results of many surveys. As such, these index values are used for relative comparison of the effects of project alternatives. For example, a project that reduces the entrainment index value for a species of fish relative to the without project index value (reflected in a negative entrainment index) is interpreted to be creating conditions that result in less entrainment of that species. **Table 4.3-22** presents the average percent change in fish entrainment from the without project conditions (Existing Condition for 2005 level of development and Future Without Project for the 2030 level of development) for each of the project alternatives for each of these species. For additional detail, see Appendix C-7.

TABLE 4.3-22
PERCENT CHANGE IN ENTRAINMENT INDEX FROM THE WITHOUT PROJECT CONDITIONS

Alternative	Delta Smelt	Longfin Smelt	Striped Bass	Winter Run Salmon	Spring Run Salmon	Fall Run Salmon	Late Fall Run Salmon
2005 Level of Development; Severe Fishery Restrictions							
Alt 1	-25%	-56%	-20%	-77%	-58%	-35%	-79%
Alt 2	-28%	-53%	-24%	-80%	-58%	-39%	-85%
Alt 3	-13%	0%	-18%	-15%	-32%	-1%	200%
Alt 4	-13%	-15%	-6%	-18%	-24%	-9%	0%
2005 Level of Development; Moderate Fishery Restrictions							
Alt 1	-23%	-57%	-30%	-78%	-60%	-38%	-83%
Alt 2	-23%	-52%	-29%	-76%	-57%	-36%	-85%
Alt 3	24%	15%	-14%	43%	72%	60%	100%
Alt 4	-12%	-7%	-7%	-14%	-19%	-16%	0%
2030 Level of Development; Severe Fishery Restrictions							
Alt 1	-6%	-45%	-12%	-66%	-44%	-20%	-72%
Alt 2	-9%	-41%	-16%	-69%	-44%	-23%	-77%
Alt 3	5%	-4%	-12%	-6%	-3%	31%	17%
Alt 4	-11%	-4%	-8%	-3%	-14%	-11%	0%
2030 Level of Development; Moderate Fishery Restrictions							
Alt 1	-6%	-47%	-16%	-66%	-40%	-20%	-76%
Alt 2	-6%	-39%	-15%	-66%	-38%	-19%	-79%
Alt 3	6%	-5%	-22%	19%	64%	38%	17%
Alt 4	-14%	-10%	-9%	-6%	-35%	-16%	0%

The values presented in Table 4.3-22 indicate that a net reduction in potential fish entrainment, which represents a fishery benefit, is created in Alternatives 1, 2, and 4. In Alternatives 1 and 2, this benefit is largely the result of improved fish screening caused by shifting water deliveries to South Bay water agencies onto the expanded Los Vaqueros Reservoir system. For Alternative 4, the benefit is smaller, and is due mainly to an increase in the years that the No-Diversion Period would apply relative to without project conditions, because the increased storage available would reduce the number of exemptions (due to low reservoir conditions) from the No-Diversion Period that would occur, particularly in dry periods.

Alternative 3 actually increases the potential for fish entrainment, largely due to the increase in pumping at Los Vaqueros intakes in fish-sensitive months in this alternative which are not offset by a corresponding reduction in pumping at less efficiently screened SWP or CVP intakes, as in Alternatives 1 or 2. To reduce or avoid these impacts, the operating assumptions could be revised to limit diversions at times when Delta fish could be impacted. Any changes to the operational assumptions would require a reassessment of the benefits and potential impacts of Alternative 3.

Particle Tracking Analysis to Assess Potential Entrainment of Larval Fish

The PTM tool described in the analysis of Impact 4.3.6 was also used to evaluate potential entrainment for larval fish. As indicated in the discussion of Impact 4.3.6, PTM studies estimate the influence of modeled Delta hydrodynamics on neutrally buoyant particles. As such, the studies are only appropriate to represent the movement of organic material and organisms that would behave as passively drifting particles. The particles are not considered to reflect movements of juvenile or adult fish within the Delta. Entrainment of juvenile and adult fish is evaluated with the Entrainment Index method, above, and the Flow Surrogate method for delta smelt salvage, described below.

Because the PTM tool does not account for fish screens, the results have been post-processed to incorporate the efficiency of positive barrier fish screens at the Old River and AIP intakes and the new Delta Intake. This analysis assumes that larvae are 5 mm in length (the approximate size of delta smelt when they hatch) and do not grow during the 120-day simulation period, which results in a conservative application of a relatively low screen efficiency, independent of growth since release (or "hatch") in the Delta. This method determines what fraction of larvae will be excluded by the positive barrier fish screens, but does not determine the ultimate fate of the larvae that are protected by the screens, which is a limitation of the PTM tool.

The particle tracking analysis is not specific to any species, and therefore does not consider fish distribution information. The results are summarized seasonally to allow interpretation for seasonal variability of fish movement. A more detailed description of PTM methodology and limitations is provided in Appendix C-7.

Table 4.3-23 shows the percentage of neutrally buoyant particles that are potentially entrained at any of the relevant water intakes, including the Old River, Rock Slough and AIP intakes, the new Delta Intake, the SWP Banks Pumping Plant and the CVP Jones Pumping Plant, and the combined set of agricultural intakes, within 120 days after the particles originated at the specified release locations. The three leftmost numeric columns of each table show the average percentage of particles that are potentially entrained for the without project condition during Winter (December through February), Spring (March through June), and Fall (September through November). The remaining columns indicated by each project alternative, show the change from the without project condition in percentage of particles that are potentially entrained for each season. Results from the future (2030) level of development with severe fishery restrictions are shown within this summary because the greatest incremental change due to the project Alternatives occurs under this set of conditions. Additional results are provided in Appendix C-7.

In Alternatives 1 and 2, a reduction in the percentage of particles entrained generally reflects a benefit of reduced potential for fish entrainment in these alternatives. The benefits are related to the relocation of some South Bay water agencies' Delta diversions to the expanded Los Vaqueros system, which provides improved fish screening relative to the SWP and CVP facilities. The benefit for larval fish as determined by PTM is not as substantial as the reductions for individual species evaluated with the fish indices discussed above because the PTM analysis assumes all larvae hatch at 5mm in length and do not grow after hatching. Because positive barrier fish screens are less than 100% efficient for the smaller size classes (e.g., planktonic larvae less than about 15 mm), this assumption results in a conservative estimate for the number of larval fish protected by positive barrier fish screens.

TABLE 4.3-23
LONG-TERM, SEASONAL AVERAGE PERCENT OF PARTICLES POTENTIALLY ENTRAINED 120 DAYS AFTER PARTICLES ARE RELEASED AT DESIGNATED LOCATIONS 2030 LEVEL OF DEVELOPMENT; SEVERE FISHERY RESTRICTIONS

	Future Without Project			Change from Future Without Project											
				Alt 1			Alt 2			Alt 3			Alt 4		
Release Location	W	S	F	W	S	F	W	S	F	W	S	F	W	S	F
Sacramento River at Freeport	24	19	54	-1	0	-1	-1	0	-1	1	0	0	0	0	0
Sacramento River above Delta Cross Channel	30	20	62	-1	0	-1	0	1	-1	1	0	0	0	0	0
Cache Slough at Sac Ship Channel	21	68	35	0	0	0	0	0	0	0	0	0	0	0	0
Sacramento River at Rio Vista	12	10	34	0	0	-1	0	0	-1	0	0	0	0	0	0
Sacramento River at Emmaton	6	5	21	0	0	0	0	0	0	0	0	0	0	0	0
Sacramento River at Collinsville	2	2	9	0	0	0	0	0	0	0	0	0	0	0	0
San Joaquin River at Jersey Island	14	9	37	0	0	-1	0	0	-1	1	0	0	0	0	-1
San Joaquin River at mouth of Old River	44	25	77	-1	0	-2	-1	1	-2	1	-1	0	0	0	0
Old River at Holland Tract	74	49	96	-3	1	-3	-3	2	-2	0	-1	0	0	0	0
Middle River at Empire Cut	87	75	97	-5	-9	-2	-5	-10	-2	1	0	1	0	0	1
San Joaquin River west of Rough and Ready Island	69	55	93	-3	-1	-2	-3	-1	-2	1	1	1	0	0	1
San Joaquin River at Mossdale	82	76	95	-2	-2	-2	-1	-2	-2	0	0	0	0	0	0
Suisun Bay at Port Chicago	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Montezuma Slough	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Seasonal averages:
W = Winter (December through February), S = Spring (March through June), and F = Fall (September through November)
Output from the particle tracking model has been adjusted to account for fish screens at the Old River and AIP intakes and the new Delta Intake, assuming the larvae are 5 millimeters in length and do not grow after hatch.

AIP = Alternative Intake Project
Alt = alternative

PTM results for Alternatives 3 and 4 show no significant change from the without project condition, as all changes remain below 2 percent, which is within the noise of the CalSim II model (see Section 4.2) and also relatively low when compared to the seasonal variability.

Delta Flow Surrogate for Delta Smelt Salvage at Export Facilities

A flow surrogate for delta smelt salvage at the SWP and CVP export facilities was used as another metric for evaluating the potential effects of operations under each of the project alternatives on Delta fish species of concern. Field data show that delta smelt salvage at the SWP and CVP export facilities is related to export flow levels and San Joaquin River flow at Vernalis during the winter months. Consequently, a weighted sum of export pumping and San Joaquin flows (total exports plus one half the San Joaquin River flow at Vernalis) was found to be a valid surrogate measure for delta smelt salvaged at the SWP Banks and CVP Jones Pumping Plants, as described in Appendix C-7.

Table 4.3-24 presents the long-term monthly average values of the flow surrogate for fish salvage at the export facilities for each of the project alternatives from December through June. This time period is presented because it captures the period in which delta smelt are typically susceptible to entrainment at the export facilities. This time period is also when the fishery restrictions included in the Existing Condition and Future Without Project are assumed to be implemented at the Banks and Jones facilities (see Appendix C-3).

As shown in Table 4.3-24, the flow surrogate values tend to be generally highest in December (within the months evaluated), and generally decrease until April, and then increase slightly in May and June. This pattern reflects the fishery restrictions that are imposed on the operation of the Banks and Jones facilities, in which export limitations are typically imposed beginning in December or January, and then generally become more restrictive in the spring. The lowest values in April and May also reflect changes in export rates under the VAMP operations, which can further decrease export pumping at Banks and Jones and increase San Joaquin River flows. The flow surrogate values are also generally lower in the severe restrictions cases than in the moderate restrictions cases, reflecting the difference in maximum allowed export levels under each set of assumptions. Alternatives 1 and 2 generally reduce the value of the flow surrogate, reflecting a fishery benefit due to potential reduction in delta smelt salvage at the SWP and CVP export facilities. This benefit is due to the reduction of diversions at the SWP and CVP Delta export facilities made possible by shifting South Bay water agencies' Delta diversions to the expanded Los Vaqueros system, through improved fish screening facilities. Alternatives 3 and 4 generally have less of an effect on the flow surrogate, as they do not shift any of the South Bay water agency diversions away from the SWP and CVP export facilities. Small changes in the average surrogate values between Alternatives 3 and 4 and the without project conditions reflect the threshold sensitivity of the CalSim II model (discussed in Section 4.2).

Alternative 1

Alternative 1 shows significant reductions in estimated potential entrainment across all species using the fish entrainment index analysis, which is based on the fish monitoring data near Delta water intakes. Additionally, for larval fish originating within the central Delta, particle tracking analysis indicates a reduction in potential entrainment; for larval fish originating in other areas of the Delta, Alternative 1 would not significantly affect entrainment. Finally, using the flow surrogate analysis, Alternative 1 would generally reduce delta smelt salvage at the export facilities.

Upon comprehensive review, the individual analyses of direct entrainment for Alternative 1 indicate a fishery benefit. This benefit is largely due to the fact that a portion of South Bay water agencies' Delta diversions would be shifted to the Los Vaqueros system, which provides improved fish screening relative to the SWP and CVP export facilities. As analyzed in this EIS/EIR, this reduction takes place at the same time as the shift to Los Vaqueros Reservoir system intakes, but the timing of the reduction could be adaptively managed to further benefit fish as described in Chapter 3.

TABLE 4.3-24
LONG-TERM MONTHLY AVERAGE AND LONG-TERM MONTHLY AVERAGE CHANGE OF FLOW SURROGATE FOR FISH SALVAGE

	December		January		February		March		April		May		June	
	Long-term Monthly Average	Average Change from Without Project Condition	Long-term Monthly Average	Average Change from Without Project Condition	Long-term Monthly Average	Average Change from Without Project Condition	Long-term Monthly Average	Average Change from Without Project Condition	Long-term Monthly Average	Average Change from Without Project Condition	Long-term Monthly Average	Average Change from Without Project Condition	Long-term Monthly Average	Average Change from Without Project Condition
2005 LEVEL OF DEVELOPMENT														
Moderate Fisheries Restrictions														
Existing Conditions	6900	--	5200	--	3500	--	2600	--	180	--	440	--	2100	--
Alternative 1	6600	-4%	4900	-5%	3200	-9%	2300	-14%	21	-89%	240	-45%	1800	-14%
Alternative 2	6600	-4%	5000	-4%	3200	-8%	2300	-12%	23	-89%	250	-43%	1800	-13%
Alternative 3	6900	1%	5400	3%	3500	1%	2800	6%	200	12%	440	0%	2100	0%
Alternative 4	6900	0%	5300	1%	3500	0%	2700	2%	190	4%	440	0%	2100	0%
Severe Fisheries Restrictions														
Existing Conditions	6800	--	5200	--	2800	--	740	--	-360	--	-170	--	270	--
Alternative 1	6500	-4%	4900	-6%	2500	-9%	380	-50%	-510	-42%	-350	-106%	34	-85%
Alternative 2	6500	-4%	4800	-7%	2500	-9%	390	-49%	-500	-42%	-350	-100%	47	-81%
Alternative 3	6900	1%	5300	2%	2700	0%	770	3%	-350	4%	-170	2%	270	0%
Alternative 4	6800	0%	5300	1%	2800	0%	750	0%	-370	-3%	-170	0%	270	0%
2030 LEVEL OF DEVELOPMENT														
Moderate Fisheries Restrictions														
Future Without Project	6900	--	5400	--	3700	--	2700	--	240	--	480	--	2100	--
Alternative 1	6600	-4%	5000	-7%	3400	-6%	2300	-12%	110	-54%	300	-38%	1900	-13%
Alternative 2	6600	-4%	5000	-7%	3400	-7%	2400	-11%	120	-50%	310	-35%	1900	-13%
Alternative 3	6900	1%	5400	1%	3800	2%	2900	7%	270	13%	490	1%	2100	0%
Alternative 4	6900	0%	5300	-1%	3700	0%	2700	1%	240	-1%	480	0%	2100	0%
Severe Fisheries Restrictions														
Future Without Project	6700	--	5300	--	2700	--	710	--	-340	--	-150	--	280	--
Alternative 1	6400	-5%	4900	-7%	2400	-8%	380	-46%	-460	-35%	-320	-113%	65	-79%
Alternative 2	6400	-4%	4900	-7%	2500	-7%	390	-45%	-460	-35%	-310	-107%	72	-75%
Alternative 3	6800	1%	5300	0%	2800	5%	870	21%	-310	11%	-160	-6%	280	1%
Alternative 4	6700	0%	5200	-2%	2700	1%	720	1%	-340	0%	-150	0%	280	1%

% = percent

Alternative 2

Similar to Alternative 1, Alternative 2 shows significant reductions in estimated potential net entrainment losses across all species for the entrainment index analysis, a reduction in potential entrainment of larval fish originating in the Central Delta using the particle tracking analysis, no effect on larval fish originating at other areas of the Delta using the particle tracking analysis, and a reduction in potential delta smelt entrainment at the SWP Banks and CVP Jones export facilities from the flow surrogate analysis. As with Alternative 1, the benefit in Alternative 2 is largely due to shifting a portion of South Bay water agencies' Delta diversions to the Los Vaqueros system, which provides improved fish screening relative to the SWP and CVP export facilities; this operation could be adaptively managed to further benefit fish.

Alternative 3

Alternative 3 shows a significant increase in potential entrainment losses compared to without project conditions using the entrainment index method, which is based on the fish monitoring data near Delta water intakes. This is a significant impact, which is caused by the operating rules assumed for these facilities in the hydrologic modeling.

Although the other two methods used to evaluate potential entrainment (PTM and flow surrogate) do not indicate conclusive changes to the risk of entrainment, the significant impacts illustrated with the entrainment index method are substantial. To reduce or avoid these impacts, the operating assumptions could be revised to limit diversions at times when Delta fish could be impacted. Any changes to the operational assumptions would require a reassessment of the benefits and potential impacts of Alternative 3. Therefore, Alternative 3 is determined to have a significant and unavoidable impact.

Alternative 4

Alternative 4 generally provides no change or slight reductions in estimated potential entrainment using the entrainment index based on fish monitoring near the water intakes. Alternative 4 effectively increases available storage in Los Vaqueros Reservoir, so it reduces the number of instances in which the No Diversion Period is waived due to insufficient stored water in Los Vaqueros Reservoir.

As evident in the particle tracking results, Alternative 4 does not produce a significant change in potential entrainment of larval fish at Delta water intakes.

The effects of Alternative 4 on the flow surrogate for delta smelt salvage are generally neutral. Small changes in the average surrogate values between this alternative and the without project condition reflect the threshold sensitivity of the CalSim II model (discussed in Section 4.2), and do not indicate any actual difference in Delta circulation or impact on Delta fisheries. The impacts of Alternative 4 would be less than significant.

Mitigation: None required for Alternatives 1, 2 and 4. Alternative 3 has significant and unavoidable impacts.

Impact 4.3.8: Fish screen maintenance activities would not significantly increase fish entrainment at the new Delta Intake or the expanded Old River Intake. (Less than Significant for Alternatives 1, 2 and 3; No Impact for Alternative 4)

Alternative 1

As part of intake operation, routine maintenance would include fish screen cleaning as well as periodic screen panel removal for inspection, cleaning, and repairs if needed. Fish screen cleaning and debris removal, as part of routine screen operations, is typically accomplished using an automated mechanical brush and/or rake system. Debris removal is intended to maintain the uniformity of approach velocities across the fish screen surface within the design criteria (e.g., 0.2 fps). As part of routine screen maintenance, CCWD would maintain the screen cleaning mechanisms (e.g., replacement brushes) and would curtail diversion operations in the event that the screen cleaners are not operating in accordance with design criteria to avoid potentially significant adverse impacts (e.g., velocity hot spots that could result in increased vulnerability of fish to impingement on the screen surface) until the screen cleaners have been returned to routine operations.

Screen panels are periodically removed from an intake structure for inspection and repair. Typically panels are removed and inspected annually, or more frequently, in the event of damage to a screen panel. When a screen panel is removed from the intake fish and macroinvertebrates would be vulnerable to entrainment into the water diversion. CCWD would curtail diversion operations whenever a screen panel was removed from the intake. In the event that a screen panel is replaced by a stop-log or blank panel (solid panel with no screen mesh) the maximum diversion rate would be reduced proportionally to the reduction in screen area to maintain acceptable approach velocities across the remaining screen panels.

The new Delta Intake and/or expanded Old River intake is not anticipated to require maintenance dredging. The existing Old River intake and fish screen have not required any maintenance dredging since their operations were initiated in 1998. While it is possible that a new intake on a different location in Old River could experience different sedimentation conditions, the intake structure would be designed to minimize the likelihood of sediment accumulation. Maintenance dredging in the river channel outside the new Delta Intake structure, if necessary, would not be part of routine maintenance, and would be permitted separately.

Based on standard operating requirements, potential impacts to Delta fishery resources resulting from routine operations and maintenance of the fish screen would be less than significant.

Alternative 2

Potential impacts on Delta fisheries and aquatic resources resulting from periodic fish screen maintenance activities under Alternative 2 would be the same as those discussed for Alternative 1. As mentioned in the Alternative 1 discussion, routine maintenance dredging is not anticipated to be necessary. The impact associated with fish screen maintenance is expected to be less than significant.

Alternative 3

Alternative 3 does not include construction of a new Delta Intake on Old River, but does include enlargement of the existing intake structure on Old River. This enlargement would increase the fish screen maintenance cleaning, because of the enlarged screen surface area. However, as mentioned in the Alternative 1 discussion, the screen cleaning maintenance activities do not create impacts. Maintenance dredging is not anticipated for this alternative. This impact would therefore be less than significant, and no mitigation is required.

Alternative 4

Alternative 4 does not include construction of a new Delta intake on Old River, so would not increase the potential need for maintenance dredging or fish screen maintenance. No impact would occur and no mitigation is required.

Mitigation: None required.

Impact 4.3.9: The project alternatives, when combined with other planned projects or projects under construction in the area, could cumulatively contribute to substantial adverse impacts to Delta fisheries and aquatic resources. (Less than Significant with Mitigation for Alternatives 1, 2 and 4; Significant and Unavoidable for Alternative 3)

All Alternatives

Construction of Alternative 1 or 2 would result in impacts that would be mitigated to less-than-significant levels. No projects are known to be ongoing or planned in the direct vicinity of the in-channel work related to Alternatives 1 and 2 at the same time that the in-channel work would occur. (See list of water-side cumulative projects in subsection 4.1.3, supra.) Therefore, no localized cumulative construction impacts would occur. The construction of Alternatives 3 and 4 would not impact Delta fisheries or aquatic resources.

The new intake structure and fish screen under Alternatives 1 and 2 would modify existing aquatic habitat by replacement and addition of riprap and would physically exclude fish from a small area of existing aquatic habitat. Although the impact to aquatic habitat characteristics resulting from use of riprap under Alternatives 1 and 2 is less than significant, it could incrementally contribute to cumulative adverse impacts to the quality and availability of aquatic habitat within the Bay-Delta estuary. Construction of the fish screen would exclude fish from about 180 feet of shoreline along the channel margin of Old River. Mitigation Measure 4.6.2b (described in Section 4.6, Biological Resources) calls for compensatory mitigation for the permanent loss of wetlands and open water habitat related to construction of the new Delta Intake and fish screens at a ratio of 2:1 for restoration and 3:1 for creation of wetland habitat. Implementation of this mitigation measure reduces the project contribution to this cumulative impact to a less than cumulatively considerable level.

Because the linear shoreline habitat where exclusion by the fish screen would occur represents only a fraction of the available habitat in the south Delta and is of low quality for rearing salmon, steelhead, and other species, this loss of aquatic habitat is not likely to adversely affect chinook salmon or steelhead populations, critical habitat for delta smelt or steelhead, or EFH for Pacific salmon within Old River and the Bay-Delta. The aquatic habitat is currently disturbed and is not unique. These factors, in conjunction with implementation of Mitigation Measure 4.6.2b, result in a less than cumulatively considerable effect on fish and their habitats.

As a result of the low design approach velocities (0.2 fps) for a water intake in the Delta, and the design of the intake to avoid hydraulic turbulence and disruption of local current patterns, long-term operation of Alternatives 1 and 2 would not be anticipated to modify hydraulic conditions next to the intake structures to a degree that would be cumulatively considerable, and no mitigation is proposed.

The analysis of Impact 4.3.6 and Impact 4.3.7 is a cumulative impact analysis, because the modeling takes into account other projects affecting Delta hydrologic conditions. As also discussed above, operation of Alternatives 1 and 2 would provide net benefits to the Delta fishery, so they would actually reduce cumulative impacts occurring in the Delta. Alternative 3 would contribute to fishery impacts as evaluated herein. Alternative 4 would generally provide small benefits to the Delta fishery and would not contribute to cumulative adverse impacts on Delta fisheries.

Mitigation for Cumulative Impacts: Implementation of Delta Fisheries and Aquatic Resources mitigation measures (measures 4.3.1, 4.3.2 and 4.3.3), together with Hazardous Materials Mitigation Measure 4.13.2, Hydrology mitigation measures 4.5-1a and Biological Resources Mitigation Measure 4.6.2b, will reduce potential impacts to less-than-significant levels. No additional measures will be required.

Impact Significance after Mitigation: Less than significant for Alternatives 1, 2 and 4. The cumulative entrainment impacts of Alternative 3 would be significant and unavoidable.

4.4 Geology, Soils, and Seismicity

This section presents an analysis of potential geology, soils, and seismicity impacts that would result from implementation of the Los Vaqueros Reservoir Expansion Project. The section includes a description of the affected environment, the associated regulatory framework (including all applicable geology, soils, and seismicity policies), the methodology, and the impact assessment. Mitigation measures are identified, where necessary, to avoid or reduce potential impacts.

4.4.1 Affected Environment

Regulatory Setting

The following federal, state, and local regulations relevant to geology, soils, and seismicity are applicable to the proposed project.

Federal

The Dam Safety and Security Act of 2002 (Public Law 107-310)

The Dam Safety and Security Act of 2002 amends the National Dam Safety Program Act of 1996 (Public Law 104-303, Section 215), which amends the National Dam Inspection Act of 1972 (Public Law 92-367). The purpose of these acts is to reduce the risks to life and property from dam failure in the United States through the establishment and maintenance of a national dam safety program that integrates the expertise and resources of the federal and non-federal communities to achieve national dam safety hazard reduction. The acts established:

- A national dam inventory
- A national inspection program by the U.S. Army Corps of Engineers with reports to the appropriate state and federal agencies
- The Federal Interagency Committee on Dam Safety chaired by the Director of the Federal Emergency Management Agency (FEMA)
- A dam safety training program
- Assistance for state dam safety programs

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (formerly the Alquist-Priolo Special Studies Zone Act), signed into law in December 1972, requires the delineation of fault rupture zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of most structures for human occupancy across these traces.[1] Cities and counties must regulate certain development projects within the zones, which includes withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement (Hart, 1997). Surface fault rupture is not necessarily restricted to the area within an Alquist-Priolo zone. None of the project components are located in an Alquist-Priolo fault rupture zone.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was developed to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site has to be conducted and appropriate mitigation measures incorporated into the project design. Mapping within the study area has not been completed by the California Geological Survey at the time of preparation of this document although it is in progress for the Altamont quadrangle, which would include a portion of the Transfer-Bethany Pipeline. However, to date there are no elements of the proposed project that have been identified in a Seismic Hazards zone.

California Department of Water Resources, Division of Safety of Dams

Division 3 of the California Water Code—the statute governing dam safety in California—places responsibility for the safety of non-federal dams and reservoirs under the jurisdiction of the California Department of Water Resources (DWR) Division of Safety of Dams (DSOD). DSOD regulates the construction of all non-federal dams in California that are 25 feet or more in height or have an impounding capacity of 50 acre-feet or more. DSOD's engineers and engineering geologists provide multiple critical reviews of new dams as well as for the enlargement and alteration of existing dams. DSOD reviews detailed studies prepared by the dam owner that address all aspects of the design such as the site geology, seismic setting, site geotechnical investigations, laboratory testing, proposed construction materials, seismic analyses, and design of the dam. Construction can only commence once DSOD has provided written approval of the plans and specifications. They then make continuous or periodic inspections during construction to verify conformance with the approved construction documents, and inspect foundations before material is placed.

Before water can be impounded behind a new dam, DWR must issue a certificate of approval to operate. These certificates may contain restrictive conditions and may be amended or revoked. DSOD engineers inspect existing dams on a yearly schedule to verify they are performing safely and are being adequately maintained.

1 A "structure for human occupancy" is defined by the Alquist-Priolo Act as any structure used or intended to support or shelter any use or occupancy that has an occupancy rate of more than 2,000 person-hours per year.

California Building Code

The California Building Code (CBC) is another name for the body of regulations known as the California Code of Regulations, Title 24, Part 2. Title 24 is assigned to the California Building Standards Commission which, by law, is responsible for administering, adopting, approving, publishing, and implementing all building standards in California.

Published by the International Code Council, the International Building Code (IBC) is a widely adopted national model building code in the United States. The 2007 CBC incorporates the IBC by reference and includes necessary California amendments. These amendments include criteria for seismic design, and approximately one-third of the CBC has been tailored to California earthquake conditions. The CBC provides engineering design criteria for grading, foundations, retaining walls, and structures within zones of seismic activity. Under the CBC, facilities are assigned seismic design categories (A through F) which are based on spectral response accelerations, soil classifications and properties, and occupancy categories. The higher the seismic design category, the more stringent the design criteria are required.

CCWD water system projects are not processed like development projects through a local county or city building department for compliance with the CBC. However, CCWD incorporates the IBC and CBC building code requirements in design and construction of all of its projects.

Local

Contra Costa County General Plan

The Contra Costa County General Plan includes goals, policies, and measures related to geology, soils, and seismicity. Goals and policies that potentially apply to the proposed project include the establishment and enforcement of erosion control procedures for all construction and grading projects (8-63); implementation of a soil conservation program which would reduce soil erosion for projects which would increase waterway or hillside erosion (8-cf); reduction of injuries and health risks resulting from the effects of earthquake ground shaking on structures, facilities, and utilities (10-B); modification of the location and/or design of proposed facilities or buildings in areas near active or inactive earthquake faults (10-13); and the requirement of a comprehensive geologic and engineering study for any critical structure (10-c) (Contra Costa County, 2005). A detailed list of the goals and policies relevant to geology, soils, and seismicity is located in Appendix E-2.

Alameda County – East County Area Plan

The East County Area Plan also contains goals, policies, and implementation programs related to geology, soils, and seismicity. These policies include evaluating the degree to which development could result in the loss of lives or property in the event of a natural disaster (310); ensuring that new major public facilities (i.e., hospitals, water storage, communications facilities) are sited in areas of low geologic risk (311); ensuring that new major transportation facilities and pipelines are designed to avoid or minimize crossings of active fault traces (312); and requiring that buildings be designed and constructed to withstand ground shaking (315). Specific policies are listed in Appendix E-1.

CCWD Standards

CCWD has specified seismic standards for all CCWD facilities in its Engineering Standard Practice Number 023.0-98 for Seismic Design Requirements and its Engineering Standard Practices and Specifications. These documents serve as a guideline for the design, repair, alteration, and rehabilitation of low-rise buildings, water retention structures, canals, small buried structures, underground piping, atmospheric storage tanks, and silos and pressure vessels. These standards incorporate codes and specifications published by the International Conference of Building Officials, the American Concrete Institute, the American Institute of Steel Construction, and the American Water Works Association. The IBC, published by the International Code Council, is a widely adopted national model building code in the United States and is used by CCWD as a basis for its building standards. Because the seismic environment in the CCWD area is more severe than the conditions anticipated by these publications, standards are modified accordingly. The purpose of CCWD standards is to provide greater reliability for CCWD facilities than would be obtained only by application of the IBC standards.

Environmental Setting

Regional Setting

The Los Vaqueros Reservoir Expansion Project facilities generally would be located in the Coast Ranges geomorphic province of California, although some of the easternmost components of the project extend into the Great Valley geomorphic province (California Geological Survey, 2002). The Coast Ranges province lies between the Pacific Ocean and the Great Valley (Sacramento and San Joaquin Valleys) provinces and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. Much of the Coast Ranges province is composed of marine sedimentary deposits and volcanic rocks that form northwest-trending mountain ridges and valleys, running subparallel to the San Andreas Fault Zone. The geology in this part of the Coast Ranges reflects a long history of mountain building, weathering, erosion, and sediment deposition in terrestrial, shallow marine, and deeper ocean environments. These processes have been driven by the interaction of the Pacific and North American Plates, which created several active faults, including the San Andreas, Hayward, and Greenville. The Great Valley geomorphic province—a low-gradient alluvial plain that is up to 50 miles wide and 400 miles long—dominates central California. The province is divided into the northern half, which is drained by the Sacramento River, and the southern half, which is drained by the San Joaquin River.

Local Setting

The project area is located in eastern Contra Costa County and a portion of northeastern Alameda County, southeast of Mount Diablo. The topography of the Los Vaqueros Dam site and adjacent area is dominated by northwest-southeast-trending ridge lines that reach an elevation of approximately 1,200 to 1,400 feet in the vicinity of the dam and reservoir. The elevations of intervening valley bottoms are approximately 400 feet mean sea level (msl) in the vicinity of the dam and reservoir. The same topography extends to the southeast towards Bethany Reservoir in Alameda County. In the vicinity of Los Vaqueros Reservoir, these ridges are separated by valleys of varying width; the ridges decline in elevation to the east and become relatively flat as the San Joaquin Valley is approached.

Los Vaqueros Reservoir – Dam Monitoring and Management

The performance and safety of the existing dam are continuously monitored and recorded by an extensive array of instruments that measure internal water pressures within and seepage from the dam and foundation, settlement of the dam, and earthquake-induced accelerations and deformations. The instruments include foundation and embankment piezometers, internal and surface settlement and movement sensors, a seepage measurement weir and a series of strong motion accelerographs. Many of these instruments are read in real time by a data acquisition system that will automatically send a signal to CCWD's operations center if a preset threshold limit is exceeded. The dam is visually inspected on a regular basis by CCWD staff, and an annual surveillance and monitoring report is prepared and submitted to DSOD.

Geology

Los Vaqueros Reservoir is located in the northwest-trending Diablo Ranges of the Coast Ranges geomorphic province, while several of the proposed project facilities would be located in the flat San Joaquin Valley section of the adjacent Great Valley geomorphic province. The Coast Ranges geomorphic province in the study area is composed of bedded and folded sedimentary rocks. The rocks are of two general ages. The older group is 65- to 144 million-year-old (Cretaceous age) marine sedimentary rocks, while the younger group is 45- to 65-million-year-old (Tertiary age) marine and nonmarine sedimentary rocks.

In the vicinity of the dam site abutments, the bedrock is mapped as the Cretaceous Panoche Formation (Wagner et al., 1990; Simpson and Schmoll, 2001). In the vicinity of the dam site, the Panoche Formation is interbedded sandstone and claystone (URS and MWH, 2004). The beds in this area dip between 15 and 40 degrees (Simpson and Schmoll, 2001; URS and MWH, 2004).

The reservoir is underlain by marine shale bedrock (Wagner et al., 1990). The Panoche Formation interbedded sandstone and claystone extends to the southeast beyond Bethany Reservoir and generally dips to the northeast. To the east of the reservoir, the bedrock in the ridges and valleys is composed of a series of sedimentary rock formations (sandstone, siltstone, claystone) of varying thicknesses. These sedimentary layers dip to the northeast. Their more erosion-resistant sandstone beds tend to form the area's topographic ridges, while more erodible siltstones or claystones dominate in the valleys. One formation, Domengine marine sandstone, is notable because rock from this formation has been used as fill around road culverts; this rock has proven to be corrosive and requires replacement (ESA et al., 2005).

Kellogg Creek is incised into adjacent river terraces composed of alluvial sediments. To the east and southeast of the reservoir, some of the northwest-southeast-trending valleys have alluvium deposited on their valley floor.

The pipelines extending from the Los Vaqueros Dam toward the Transfer Facility would be located within the Panoche Formation heading eastward until the lower elevations where it transitions into the alluvial sediments as mentioned above. The Transfer Facility is located in an area of tilted sandstone formations that include the Domengine, Markley, and Meganos Formation's (Wagner, 1990). The Transfer-Bethany pipeline alignment continues within the Panoche Formation.

Landslides

Ground failure can be dependent on slope angle and geology as well as the amount of rainfall, excavation, or seismic activities. A slope failure is a mass of rock, soil, and debris displaced downslope by sliding, flowing, or falling. Steep slopes and downslope creep of surface materials characterize landslide-susceptible areas. Debris flows consist of a loose mass of rocks and other granular material that, if present on a steep slope and saturated, can move downslope.

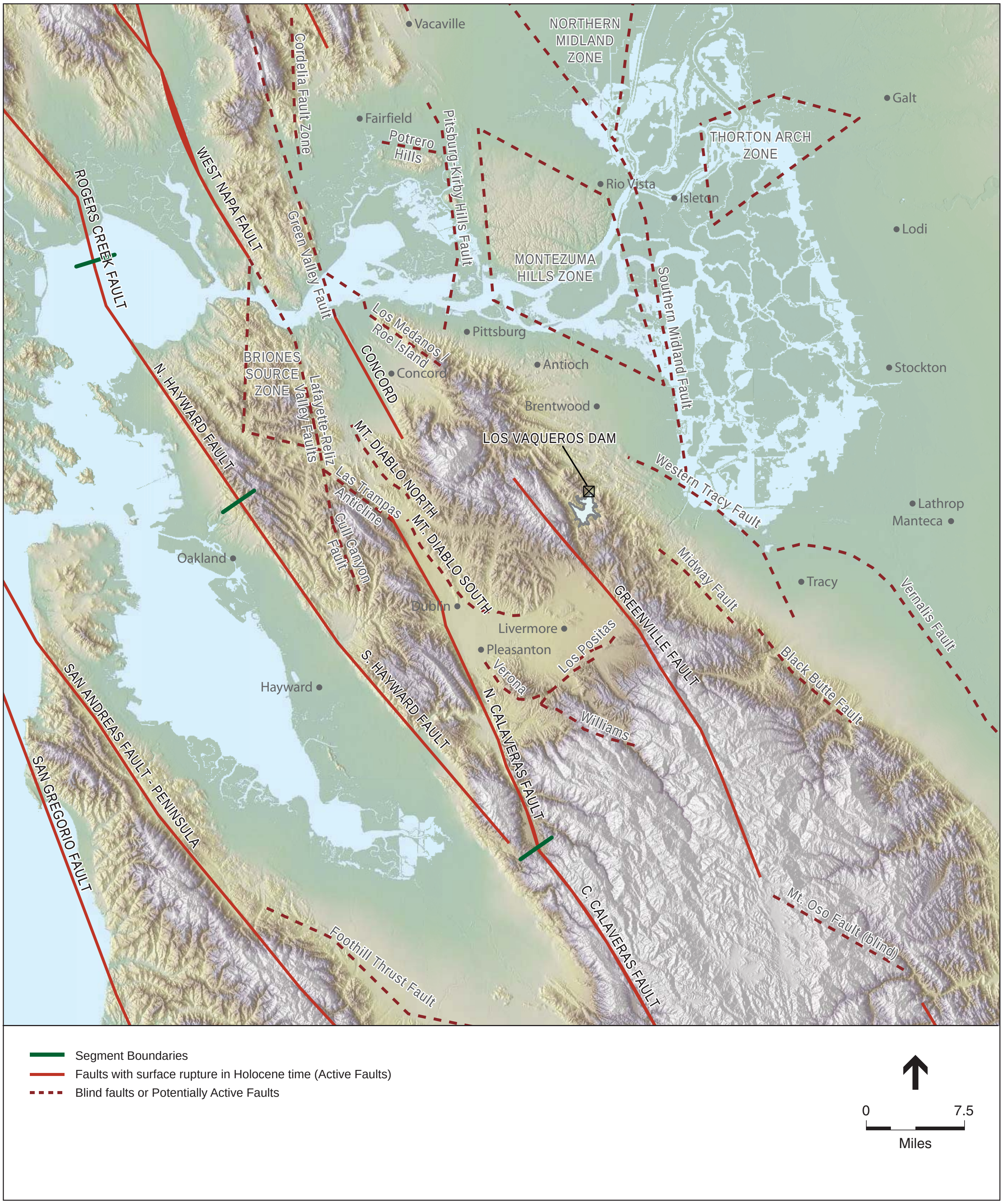
The rate of rock and soil movements can vary from a slow creep over many years to sudden mass movements.

Construction of the existing Los Vaqueros Dam required the excavation of one landslide down to stable bedrock (Simpson and Schmoll, 2001). URS and MWH (2004) identified landslides in the vicinity of the Los Vaqueros Dam site. They mapped one large landslide and two smaller landslides in the vicinity of the left abutment, and identified three possible landslides upstream of the right abutment of the dam. Several areas of landslides are mapped within the Los Vaqueros Reservoir watershed and along the routes for the Transfer-Bethany Pipeline (Ellen et al., 1997; Pike, 1997). The latter mapping identified slides and earthflows along the upland areas of the pipeline alignment toward the South Bay Aqueduct connection. Slides are larger features that move slowly, in contrast to earthflows, which are smaller but move rapidly. The Transfer Facility is located at lower elevations where the topography is generally gentler and less susceptible to landslides or slope failures. Other facilities located in the flatter regions of the study area include the new Delta Intake and Pump Station, the Delta-Transfer Pipeline, and the Western Area Power Administration (Western) substation. There are no known landslides in these areas and any improvements would not likely cause any slope instability based on the topography.

Seismicity

The study area is in a seismically active region influenced by the faults of the San Andreas system including San Andreas, Hayward, and Calaveras Faults (see **Figure 4.4-1**). Seismic hazard evaluations for the existing Los Vaqueros Reservoir identified five faults as the most significant seismic sources to the site: the Mount Diablo thrust, Greenville, Calaveras, Hayward, and San Andreas faults (**Table 4.4-1**; CCWD and Reclamation, 1993). However, for seismic design purposes, the Greenville Fault and the San Andreas Fault were considered as the controlling faults or, in other words, the two faults capable of causing the most damaging effects at the dam. Controlling faults are determined based on the magnitude of the maximum credible earthquake (MCE) that can be generated by a particular fault and the distance between that fault and the proposed improvement. The Greenville Fault is approximately 4 miles from the reservoir and has a calculated MCE of magnitude **M** [2] 7.0 (URS and MWH, 2004). The MCE on the San Andreas Fault

2 Earthquake magnitude is a measure that relates to the seismic energy radiated by an earthquake and measured on a seismograph; it can be reported in slightly different ways (California Geological Survey, 2002b). Moment magnitude, **M**, is the most commonly used scale today because it is considered to give a consistent scale of earthquake size. Moment magnitude is also used in the International Building Code to indicate earthquake size.



SOURCE: URS Seismic Source Model, 2008; and ESA, 2008

Figure 4.4-1
Regional Fault Map

TABLE 4.4-1
ACTIVE REGIONAL FAULTS

Fault	Approximate Distance[a]	Fault Classification[b]	Maximum Credible Earthquake[c]
Greenville	4 miles west	Active	7
San Andreas	40 miles west	Active	8
Mount Diablo blind thrust	8 – 9.5 miles southwest	Active	6.8
Calaveras	18 miles west	Active	7
Hayward	21 miles west	Active	7.1
Pittsburg–Kirby Hills (Montezuma Hills)	13.5 miles north	Late Quaternary	6.6
Concord–Green Valley	15.5 miles northwest	Active	7.1

[a] Distance from Los Vaqueros Dam.
[b] An "active fault" is defined by the California Geological Survey as one that has displayed displacement within the last 10,000 years). A "potentially" active fault is defined as a fault that has shown evidence of surface displacement within the past 1.6 million years. "Late Quaternary" refers to a fault with displacement in the last 700,000 years. The California DSOD fault activity guidelines (Fraser, 2001a) differentiate active seismic sources, conditionally active seismic sources, and inactive seismic sources. There are two subcategories of active seismic sources: Holocene active (within the last 11,000 years) and Latest Pleistocene (less than 35,000 years old but older than 11,000 years) active. The distinction between these two subcategories is descriptive, and both categories are treated as active seismic sources for design purposes. Inactive faults have had no surface or subsurface displacement in the last 35,000 years, and inactivity is demonstrated by fault traces that are consistently overlain by unbroken geologic materials that are older than 35,000 years.
[c] The maximum credible earthquake is an estimated moment magnitude (M) for the largest earthquake capable of occurring on a fault.

SOURCES: CCWD and Reclamation, 1993; Jennings, 1994; Petersen et al., 1996; Fraser, 2001a; URS and MWH, 2004.

(**M** 8.0 at 40 miles) could induce seismic deformations comparable to those on the Greenville Fault and therefore was also included as a controlling fault for design purposes (Woodward Clyde Consultants, 1995).

In addition, since the construction of the Los Vaqueros Dam, a new fault system, the Mount Diablo blind thrust, located about 12 miles southwest of the reservoir, has been identified. Blind thrust faults do not reach the earth's surface and therefore are not as easily recognized as other faults. The MCE for the Mount Diablo blind thrust is **M** 6.8; therefore, the Greenville and San Andreas Faults remain the controlling faults for the reservoir expansion (URS and MWH, 2004).

For a small percentage of the dams worldwide, the weight associated with large deep reservoirs and the increased pore pressure has triggered small localized earthquakes. The induced earthquakes are often associated with initial filling of the reservoirs. The potential for reservoir triggered seismicity (RTS) was evaluated for the original Los Vaqueros Reservoir and considered to be low to moderate, with most of the activity likely to be experienced as relatively low magnitude events (Wong and Strandberg, 1996). The study determined that the MCE on the Greenville or San Andreas Faults would generally produce greater ground shaking than any local reservoir-induced event (Wong and Strandberg, 1996). Since the initial filling of Los Vaqueros Reservoir in 1998, no reservoir-induced seismicity has been observed. Like the original dam, the proposed dam modifications for the reservoir expansion would be designed to withstand activity on the two controlling faults and thus would be sufficient to withstand potential RTS activity.

Seismic Hazards

The project area could be affected by a major earthquake along seismically active or potentially active fault lineaments during the project life. The three major hazards associated with earthquakes are ground shaking, liquefaction, and settlement. Lateral spreading is also addressed in this section.

Ground Shaking

The amplitude and frequency content of ground shaking is related to the size of an earthquake, the distance from the causative fault, the type of fault (e.g., strike-slip), and the response of the geologic materials at the site. Ground shaking can be described in terms of acceleration, velocity, and displacement of the ground. As a rule, the greater the earthquake magnitude and the closer the fault rupture to a site, the greater the intensity of ground shaking. The ground shaking hazard has been estimated at Los Vaqueros Reservoir. The highest ground motions would be generated from a **M** 7.0 earthquake on the Greenville Fault. Given the relatively close distance to the fault (4 miles), the potential ground shaking is expected to be strong to very strong at the reservoir site if such an event occurs (ABAG, 2008) on this fault. In addition, because the San Andreas Fault can produce a very large earthquake, **M** 8.0, such potential ground shaking has also been addressed in design studies for Los Vaqueros Dam. The seismic design of the dam includes the modeled calculations of dynamic forces that could be expected from these controlling faults to ensure that the dam could withstand such forces.

Liquefaction

Liquefaction is an earthquake induced phenomenon in which loose to moderately dense saturated granular sediments temporarily lose their shear strength and become fluid-like. Liquefaction-induced phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects. Susceptibility to liquefaction depends on the depth and density of the sediments and the magnitude of earthquake. Saturated, unconsolidated silts, sands, silty sands, and gravels within 50 feet of the ground surface are most susceptible to liquefaction.

The alluvial deposits throughout much of the project area do not pose a liquefaction hazard to the existing or to the proposed dam expansion and conveyance facilities. At the dam site, all alluvial materials from the dam foundation were removed during construction so that the dam is founded entirely on bedrock. Alluvial deposits within the reservoir or landslide deposits found around the reservoir rim that may be susceptible to liquefaction pose no hazard to the existing dam or to the proposed dam expansion because the dam will not be structurally founded on these deposits. The existing and proposed new intake locations along Old River are in areas with liquefaction potential; however these areas would be identified during design and treated during construction to mitigate the risk. Liquefaction potential for all project elements is further discussed below in the Environmental Consequences section.

Settlement

Ground surface settlement can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid compaction and settling of surface materials—particularly loose, non-compacted and variable sandy sediments—due to the rearrangement of soil particles during prolonged ground shaking. Saturated, unconsolidated sands and fine-grained sediments are associated with the deposits of the San Joaquin River and other low-gradient streams in the Great Valley geomorphic province. Settlement would generally be considered a lower potential for higher areas such as pipeline alignments within the upland regions and the embankments of the reservoir**.** The potential for settlement would be greatest in lowland areas such as the area of the Old River near the existing Old River Intake and the proposed new Delta Intake and Pump Station, where compressible alluvial sediments are thickest.

Lateral Spreading

Lateral spreading generally is a phenomenon where blocks of intact, non-liquefied soil move down slope on a liquefied substrate of large areal extent (Youd et al. 1978 and Tinsley et al. 1985). This condition is unlikely to be present around the rim of the reservoir but in any case would not present a threat to the existing dam or proposed dam expansion. As described above, the dam foundation is underlain by bedrock that is not susceptible to liquefaction or lateral spreading. In accordance with standard geotechnical practices, the potential for lateral spreading is considered along with liquefaction potential. The potential for lateral spreading affecting project facilities is discussed further below in the Impacts and Mitigation section.

Soils

Soils can have certain properties or limitations that need to be addressed with respect to their use for different purposes. These limitations include subsidence, shrink-swell potential, erosion potential, and corrosivity. Each of these constraints is discussed further with respect to potential occurrence in the project area.

Subsidence

Subsidence is the gradual lowering of the land surface due to compaction of underlying materials. Subsidence can occur as a result of hydrocompaction; groundwater, natural gas, and oil extraction; or the decomposition of highly organic soils. The proposed project does not include elements such as extraction of subsurface resources that would potentially cause subsidence. Therefore, the hazard of subsidence is not discussed further in this document.

Shrink-Swell Potential

Expansion and contraction of expansive soils in response to changes in moisture content can cause differential and cyclical movements that can cause damage and/or distress to shallow founded structures and equipment. Issues with expansive soils typically occur near the ground surface where changes in moisture content typically occur. Often times, grading, site preparations, and backfill operations associated with pipelines can eliminate the potential for expansion. The potential for shrink-swell conditions to affect the proposed project elements is further discussed in the Impacts and Mitigation section.

Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind and underground water. Excessive soil erosion can eventually lead to damage of building foundations and roadways. At the project site, areas that are susceptible to erosion are those that would be exposed during the construction phase and along the shoreline where soil is subjected to wave action. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or slope protection. Soil erosion is a potential issue at the proposed facility sites and is discussed in the Impacts and Mitigations section.

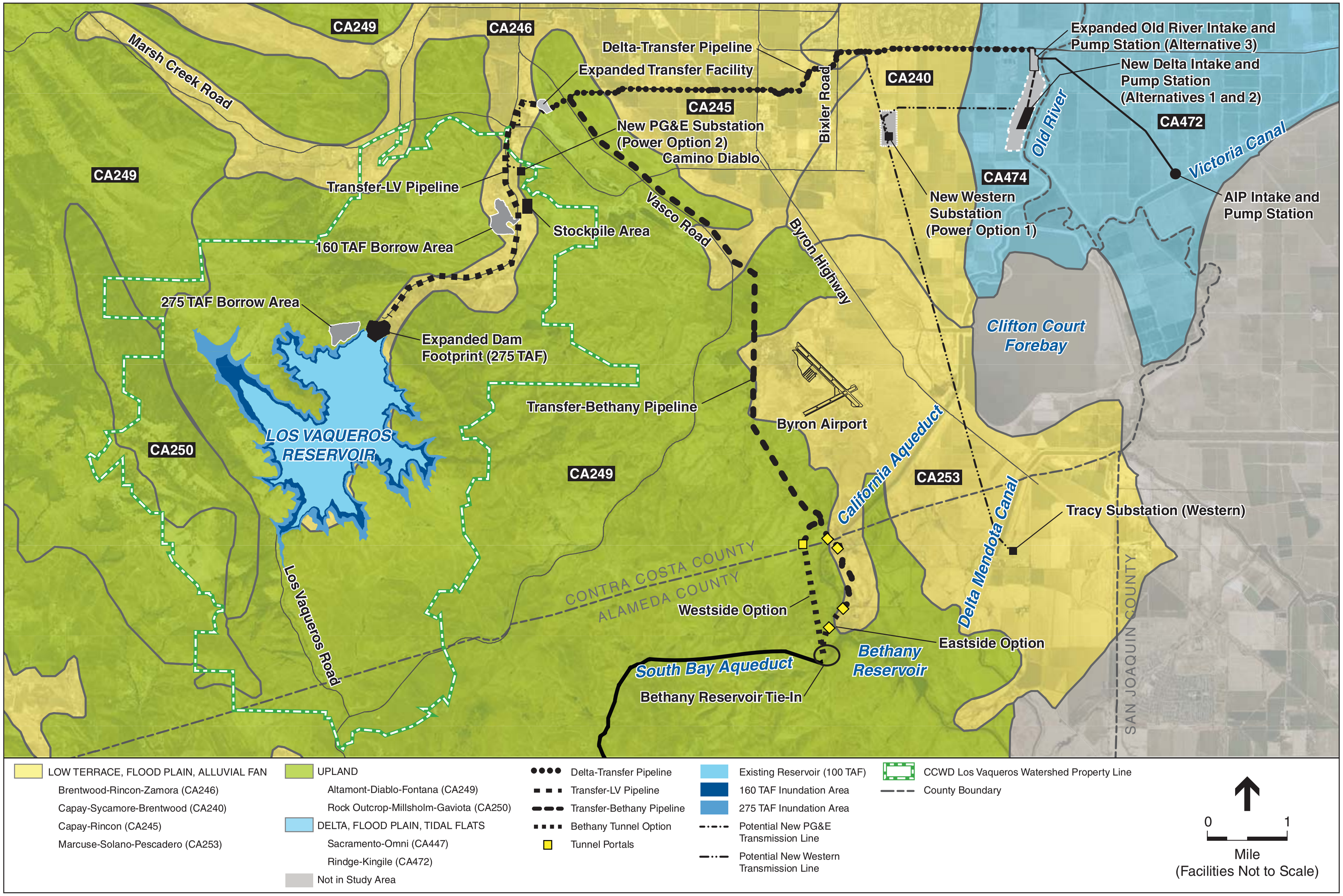
Corrosivity

Corrosivity refers to potential soil-induced electrochemical or chemical action that could corrode or deteriorate concrete, reinforcing steel in concrete structures, and bare-metal structures exposed to these soils. The rate of corrosion is related to factors such as soil moisture, particle-size distribution, and the chemical composition and electrical conductivity of the soil. The natural soils found along the pipeline alignments in the project area may be moderately corrosive**.** The materials used in the construction of modern pipelines are typically designed to resist the effects of corrosion over the design life of the pipeline. In addition, native soils are typically replaced by engineered backfill which generally has a low corrosive potential.

Project Area Soils

The project area soils are grouped into generalized soil associations that reflect the bedrock and various alluvial parent materials from which they are derived (Welch, 1977). The upland or bedrock soils belong to one soil association; the alluvial soils belong to five soil associations. Soil associations in the project area are shown on **Figure 4.4-2**. The characteristics of these soils are summarized in **Table 4.4-2**. The soils tend to be neutral to moderately alkaline; localized areas of alkaline soils and vegetation develop in some valley bottoms. The upland soils developed in sandstone and finer-grained bedrock belong to the Altamont-Diablo-Fontana soil association. These soils are strongly sloping to very steep with well-drained clay and silty clay loam textures and have slight to high erodibility.

The alluvial soils belong to five soil associations. The Brentwood-Rincon-Zamora soil association occurs along Kellogg Creek and the alluvial fans at the Coast Ranges to Great Valley transition zone. These soils are nearly level to gently sloping with well-drained clay loams and silty clay loams. The Capay-Sycamore-Brentwood, Sacramento-Omni, and Rindge-Kingile soil associations form on the lower-gradient, more fine-grained stream deposits or in organic materials derived from decaying plants; these soils occur downstream on progressively finer-grained and more poorly drained deposits. The Capay-Sycamore-Brentwood soil association ranges from moderately well-drained to poorly drained clays, silty clay loams, and clay loams on valley fill and floodplains. The Sacramento-Omni soil association is composed of nearly level poorly drained to very poorly drained clays and clay loams on the Delta and floodplains. The Rindge-Kingile soil association is on nearly level, very poorly drained surfaces composed of organic mucks adjacent to the Old River. The Capay-Rincon soil association consists of moderately well-drained and well-drained clays and clay loams.



SOURCE: Welch, 1977; NRCS, 2006; and ESA, 2008

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Figure 4.4-2
Soil Associations

TABLE 4.4-2
PROJECT AREA SOIL CHARACTERISTICS

Soil Association/Soil	Shrink-Swell	Erodibility	Corrosivity
Altamont	High	Slight to High	High
Diablo	High	Slight to High	High
Fontana	Moderate	Slight to Moderate	High
Brentwood	High	Low	High
Rincon	Moderate to High	Slight to Severe	Moderate to High
Zamora	Moderate	Slight	High
Sacramento	High	Low	Very high
Omni	Low	Low	High
Rindge	High shrink, low swell	Very low	Very high
Kingile Muck	High shrink, low swell	Very low	Very high
Capay	Low	Slight	High
Sycamore	Moderate	Slight	High
Brentwood	High	Low	High
Capay	Low	Slight	High
Rincon	Moderate to High	Slight to Severe	Moderate to High

SOURCE: Welch, 1977.

Mineral Resources

According to the identified mineral resource areas within the Contra Costa County (2005) and Alameda County (1994 and 2002) General Plans, the primary mineral resource areas are located outside of the study area (Contra Costa County, 2005 and Alameda County, 2002). The only exception is a deposit of Domengine sandstone located south of Camino Diablo and east of Vasco Road. The proposed Transfer-Bethany Pipeline in this area is located within Vasco Road and therefore would not interfere with the availability of this resource. In addition, no oil and gas operations exist in the project area. Potential project facilities do not fall within any areas identified as mineral resource areas. Therefore, the project alternatives would not result in the loss of availability of any known mineral resource, or interfere with any existing commercial mining activity. No impacts to mineral resources would occur and no further evaluation is included in this document.

4.4.2 Environmental Consequences

Methodology

This analysis considers the potential of the Los Vaqueros Reservoir Expansion Project and alternatives to interact with the local geologic environment to produce conditions that would exceed the applied significance criteria identified below.

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines and professional judgment of the EIS/EIR preparers. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant impact if it would do any of the following:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, strong seismic ground shaking, or seismic-related ground failure, including liquefaction and landslides
- Result in substantial soil erosion or the loss of topsoil
- Be located on a geologic unit or soil that is unstable or would become unstable as a result of the project, and potentially result in onsite or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse, creating substantial risks to life or property; or be located on an expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1995), creating substantial risks to life or property
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

The project would not expose people or structures to injury, death, or damage from fault rupture because none of the proposed project components intersect any active faults, as determined by California Geological Survey mapping performed in accordance with the Alquist-Priolo Earthquake Fault Zoning Act. Accordingly, fault rupture is not discussed further in this section.

Soils that are susceptible to collapse are typically found in regions outside of the project area. Collapsible soils are most often encountered in arid climates, where wind and intermittent streams deposit loose low-density materials. When placed under new loading or the addition of water that reaches deeper than under normal conditions, these soils can collapse causing structural damage. However, these conditions or soils are not found in the study area and therefore there is no potential for collapsible soils and it is not discussed further in this section.

As discussed above in the setting section, lateral spreading is a hazard that is associated with liquefaction. Therefore, where the impact discussion below refers to potential liquefaction hazards, it addresses any potential lateral spreading hazards.

At the Los Vaqueros Reservoir day-use areas, wastes and wastewater from the public restrooms and other facilities are regularly pumped and captured in a holding tank and hauled offsite by a contractor for treatment. Because there are no septic systems to be evaluated, there is no further discussion of soil capability related to septic tanks or alternative wastewater disposal systems.

Impact Summary

Table 4.4-3 provides a summary of the impact analysis for issues related to geology, soils, and seismicity.

TABLE 4.4-3
SUMMARY OF IMPACTS – GEOLOGY, SOILS, AND SEISMICITY

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.4.1: The project facilities would be designed and engineered in accordance with seismic code requirements. As a result, the project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking or seismic-related ground failure, including liquefaction and landslides.	LS	LS	LS	LS
4.4.2: During construction and operations, the project could result in substantial soil erosion or the loss of topsoil.	LSM	LSM	LSM	LSM
4.4.3: Project components could be located on expansive or corrosive soils or on a geologic unit or soil that is unstable or could become unstable as a result of the project or construction activities; however, those components would not likely result in onsite or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse, and would not create substantial risks to life or property.	LS	LS	LS	LS
4.4.4: The proposed project would not make a cumulatively considerable contribution to cumulative effects associated with erosion, topsoil loss or increased exposure to seismic or other geohazard risks.	LS	LS	LS	LS

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed. Therefore, this alternative would have no impact associated with geological hazards or soil erosion. All of the geotechnical hazards described in Section 4.4.1, Affected Environment would remain as under existing conditions. The No Project/No Action Alternative would not create any conditions to increase those hazards or result in risks to people, structures, or the environment.

Impact 4.4.1: The project facilities would be designed and engineered in accordance with seismic code requirements. As a result, the project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking or seismic-related ground failure, including liquefaction and landslides. (Less than Significant)

Alternative 1

This alternative includes many elements of new construction, modification, and expansion of existing facilities. These proposed facilities extend over a range of geologic materials and environments from saturated, unconsolidated sands and fine-grained deposits of the Delta to bedrock deposits of the Panoche Formation as described above in the setting section. Seismic effects can vary depending on underlying geologic materials and conditions. Therefore, the potential seismic impact is presented below by proposed facility or project component.

Los Vaqueros Reservoir Expansion/Dam Modification

Ground Shaking. Active faults capable of producing strong ground motions are located near the dam and the dam related facilities, which could experience a major earthquake within the operational life of the project. However, the proposed modifications to the dam would be designed according to the latest seismic design standards. Strong ground motion at Los Vaqueros Reservoir and the corresponding response of the dam has been calculated to potentially cause structural deformation of the dam on the order of 1 to 2 feet but would not result in the uncontrolled release of water from the reservoir. The spillway and inlet/outlet structure would be designed to be fully operational after the earthquake.

The existing Los Vaqueros Dam is a well-compacted zoned-earthfill embankment dam that has performed well since the reservoir was first filled 10 years ago. No significant issues have developed with internal pressures, seepage, or deformation in either the embankment or its foundation, and the dam continues to perform well within the parameters set during the design.

Under Alternative 1, the Los Vaqueros Dam, spillway and inlet/outlet structure would be designed to accommodate the maximum credible ground motion for the site, determined from a detailed seismic hazard study that would evaluate all faults that could conceivably affect the dam. A very conservative approach would be taken in the engineering and design to raise the Los Vaqueros Dam. The enlarged dam would be designed in accordance with standard industry practices, codes, and standards that been developed and proven over many decades, and have evolved from practical experience at dams where performance limits have been exceeded. Multiple lines of defense or design redundancy will be incorporated into the design, and protective features will be used to counter potential adverse conditions that might occur. Conservative safety factors will be applied to the design to compensate for uncertainties in features such as the geologic conditions at the site, variability in the properties of soils in the dam, and the magnitudes of flood and seismic hazard risks. As part of the design, the dam modifications would be founded directly onto underlying bedrock. The design would include site-specific investigations and development of project-specific design criteria based on site-specific geologic and seismic hazards, including fault rupture, ground motions generated by earthquakes, slope instability, and liquefaction. The materials and internal zoning of the dam will produce a structure that is very tolerant to seismic deformation and will safely resist the maximum credible earthquake. The engineering, and the plans and specifications will be carefully reviewed by DSOD and an independent review board at multiple stages during the design. Following completion of the project, DSOD will issue a certificate of approval to operate the reservoir once they are satisfied the dam has been constructed in conformance with the approved plans and specifications and that the design intent has been met.

Liquefaction and Landslides. All alluvial materials from the dam foundation were removed at the dam location during the original dam construction so that the dam is founded entirely on bedrock. There is no evidence that the alluvial deposits within the reservoir or landslide deposits found around the reservoir rim contain materials susceptible to liquefaction (Ellen et al., 1997; Pike, 1997). In any case, liquefaction of material within the reservoir poses no hazard to the existing dam or to the proposed dam expansion because all liquefiable materials that could potentially affect the dam were previously removed.

Landslides have been identified and mapped by the United States Geological Survey (USGS) in a couple of different Bay Area wide studies of debris flows and landslides (Ellen et al., 1997; Pike, 1997)**.** Similar to engineering design measures implemented for the existing Los Vaqueros Reservoir (Fraser, 2001b; Simpson and Schmoll, 2001), adherence to CCWD standards will include measures (including excavation to a stable base) to minimize the risk of landslides due to heavy precipitation or ground shaking. Regardless, no major or rapid landslides have been previously identified at the site; consequently, the risk of damage to the dam or nearby workers or users from rapid landsliding is considered very small.

Delta Intake Facilities

Ground Shaking. The Delta intake facility improvements under this alternative would consist of constructing a new Delta Intake and Pump Station just south of the existing intake along Old River. The geologic conditions and hazards in this area include thick alluvial deposits that are susceptible to amplified ground shaking during a significant seismic event. Typically construction on these types of geologic materials requires geotechnical considerations to ensure that seismic stability is incorporated into design and carried through during construction. Whereas the intake facilities would primarily be controlled remotely and thus presenting little risk to any workers, CCWD standards still require that the design be sufficient to withstand anticipated ground shaking during a major seismic event. Common foundation recommendations such as deep foundation systems that anchor the foundation to deeper more competent materials or placement of stockpiles on building site (surcharging) to create more competent materials are proven methods of geotechnical mitigations that can minimize the potential damage from ground shaking. CCWD construction requirements include seismic design measures that incorporate site specific data such as engineering properties of underlying geologic materials and distance to active faults to create site specific seismic code requirements to ensure the safety and integrity of the structure. A geotechnical investigation would provide the necessary site specific data and information.

Liquefaction and Landslides. The proposed new Delta Intake and Pump Station is underlain by thick alluvial materials that are considered to have a high liquefaction potential (Knudsen et al., 2000). A geotechnical investigation would include an evaluation of liquefiable materials. The subsurface conditions in the siting zone for the Delta Intake and Pump Station are expected to include a series of fine sands, silts, clays, and peat that are susceptible to liquefaction. Accordingly, the facility would need to be supported on a foundation system such as driven concrete or steel piles as was used for the existing Old River Intake and Pump Station. These driven piles allow for above ground improvements and even pipelines to be founded on more stable non-liquefiable layers at depth. For purposes of this EIS/EIR impact analysis, it is assumed that piles would be driven to an approximate elevation of -50 feet msl and spaced about 15 feet apart on a square grid. In addition to the piles, stone columns would be used to densify the soil in the area around the intake structure to reduce the liquefaction potential of the soil and to improve its lateral strength during seismic events.

The proposed new Delta Intake and Pump Station is located adjacent to Old River on the valley floor. The proposed building site and surrounding area are relatively flat, which makes the landslide potential very low. Therefore, no on or off-site landslides are anticipated to affect or be affected by the proposed intake facility.

Conveyance Facilities

Construction of project pipelines under Alternative 1 would primarily use the open-trench method, as shown on Figure 3-25, Pipeline Construction Schematic. The Transfer-Bethany Pipeline would involve some tunnel construction at the southern end. The other proposed conveyance facilities include the Delta-Transfer Pipeline, the Transfer Facility Expansion, the Transfer-LV Pipeline, the Inlet/Outlet Pipelines, the Transfer-Bethany Pipeline, and the blow off and air valves associated with each pipeline.

Ground Shaking. As described above, the project area is located in a seismically active region. All the conveyance facilities described above extend across a wide range of geographical and geological environments. Ground shaking effects typically differ among varying geologic materials in addition to other factors such as distance to earthquake epicenter and magnitude of event. In general, ground shaking at locations underlain by bedrock is experienced as sharp but short-lived ground motions whereas thick soft alluvial sediments can amplify ground motions and cause longer periods of shaking. Typically, buried conveyance facilities are at less risk of damage from ground shaking than above ground structures. Modern construction materials combined with appropriate geotechnical engineering such as compacted engineered fill surrounding buried conveyance facilities can minimize the potential for damage. CCWD construction requirements are designed to ensure that conveyance facilities are constructed to withstand anticipated ground shaking.

Liquefaction and Landslides. Liquefaction potential varies across the project area with areas of high susceptibility and those of very low susceptibility. In general, in areas underlain by bedrock or upland regions where groundwater is deep, there is a very low potential for liquefaction. Liquefaction potential is high along upper Kellogg Creek and on the deposits within the San Joaquin Valley (Knudsen et al., 2000). Therefore, the Delta-Transfer Pipeline and the Transfer-LV Pipeline would be located or at least partially located in areas where there is a high potential for liquefaction. In general, buried pipelines can be particularly susceptible to damage as a result of liquefaction if not appropriately engineered. As previously mentioned, evaluating the potential for liquefaction is a standard practice for geotechnical engineering and therefore the design of all conveyance facilities will include an analysis for liquefaction. If present, the geotechnical investigation reports will include engineering recommendations to minimize the potential for damage to the conveyance facilities. Typical engineering measures include removal of liquefiable materials, soil treatments, and replacement with engineered fill materials. Standard geotechnical and engineering design procedures would minimize the potential for these soils to affect the conveyance facilities.

The Delta-Transfer Pipeline is located in a relatively flat region that has little likelihood of being impacted by landslides. Both the Transfer-LV Pipeline and the Transfer-Bethany Pipeline, however, would include upland locations with steeper terrain. According to USGS mapping, no known landslides have been identified along any of the proposed pipeline routes (Ellen et al., 1997; Pike, 1997). Tunneling proposed as part of construction of the Transfer-Bethany Pipeline would be accomplished according to CCWD standards, which include measures for addressing potential slope failures. Slope stability would be most important during the construction phase as the tunnel would be shored for the purposes of installing the pipeline. Once installed and appropriately backfilled according to CCWD standards, the potential for landslides or slope failures to impact the pipeline would be minimized.

Power Supply Infrastructure

There are two power options proposed under Alternative 1. Under Power Option 1, power supplied to the new Delta and/or Old River Intake and Pump Stations would include using an existing 230 kV transmission line from the Tracy Substation adjacent to the Central Valley Project (CVP) Jones Pumping Plant. A new Western substation, installed at the eastern terminus of Camino Diablo Road, would step power down from the 230 kV line to 69 kV. From the substation, an existing 69 kV power line to the Old River Pump Station would be upgraded, replaced, or have an additional line added. For the Expanded Transfer Facility, a new 21 kV distribution line would be installed from the new substation, paralleling the existing 230 kV line until it intersects the Delta-Transfer Pipeline, at which point the distribution line would be installed within the pipeline alignment. See Figure 3-20 in Chapter 3, Project Description. Impacts along this alignment are analyzed above, under Conveyance Facilities.

Regarding Power Option 2, additional power supplied to the New Delta and/or Old River Intake and Pump Stations would entail construction of a new 69 kV power line which would be constructed from the Western substation south of the Harvey O. Banks Pumping Plant to the intersection of the existing 69 kV power line. The existing power line would be upgraded, replaced, or have an additional line added. Additional power supplied to the Expanded Transfer Facility would include construction of a new Pacific Gas & Electric (PG&E) distribution substation located within the Los Vaqueros Watershed. The substation would step power down from an existing 230 kV transmission line to 21 kV. From the proposed PG&E substation, a new distribution line would traverse west and then north following an existing alignment to the Expanded Transfer Facility.

Ground Shaking. All new construction and expansion of existing facilities required for either Power Options 1 or 2 would be accomplished according to the recommendations of geotechnical investigations. In general, power lines are designed to withstand the effects of high winds; these design features would also accommodate the effects of any potential ground shaking. Regardless, all proposed facilities would be designed according to the recommendations of geotechnical investigations, which are prepared by state licensed professionals. Incorporation of these site-specific recommendations into the design according to industry standard construction requirements would reduce the potential damage to any improvements. Current requirements include measures for calculating foundation design specifications to ensure that these improvements can withstand anticipated ground shaking. In addition, Western and PG&E have their own internal construction requirements that meet or exceed the IBC and California Public Utilities Commission requirements.

Impacts associated with the construction and operation of either the Western or PG&E substation or all the new power/distribution lines would be less than significant with adherence to the industry standard design requirements and standard practices for construction of power/distribution lines.

Liquefaction and Landslides. As previously discussed, liquefaction potential varies across the project area. The proposed Western and PG&E substations and the power line alignment are located in an area considered to have a high potential for liquefaction. As also discussed, industry standard geotechnical practices would ensure that proposed power supply facilities would be constructed with appropriate measures such as IBC requirements to address any potential liquefaction hazards, if present. Such measures could include soil treatment or replacement with engineered fill.

Recreational Facilities

New dam construction and the expanded reservoir capacity would require the replacement of marina facilities, including a Marina Complex with a residence for the Marina Manager, Interpretive Center, fishing piers, parking areas, picnic facilities, access roads, and hiking trails.

Ground Shaking. Similar to the aforementioned improvements, all new construction for the proposed recreational facilities would be accomplished according to the recommendations of geotechnical investigations. The geotechnical investigations, conducted by state licensed professionals, would include recommendations for design criteria based on anticipated ground shaking in accordance with CCWD requirements. These requirements include seismic design criteria that when followed would prevent any of these proposed recreational facilities from collapse or significant structural damage. Public safety is at the forefront in the development of these codes which incorporate decades of research and study of performance of structures during significant seismic events that have occurred all over the world. Incorporation of these site-specific recommendations into the design would reduce the potential damage to any improvements.

Liquefaction and Landslides. In the area of the proposed recreational facilities, bedrock is either at the surface or at shallow depths beneath the surface. The liquefaction potential of the bedrock areas is mapped as very low (Knudsen et al., 2000). The proposed fishing piers, however, would be partially located above saturated reservoir sediments that could potentially liquefy. Generally, posts constructed for piers are anchored at depth beneath any liquefiable materials. Regardless, prior to construction, these facilities would undergo a geotechnical investigation and appropriate structural design according to CCWD construction requirements to ensure that they are not susceptible to significant damage from liquefaction.

The proposed recreational facilities are located in areas that are relatively flat or are not within known landslides or debris flows (Ellen et al., 1997; Pike, 1997). The geotechnical investigations completed above would also include site specific investigations to ensure that structures are not at risk of any landslides or debris flows. CCWD construction and grading requirements include measures for limiting the potential for slope failure associated with new construction.

Summary

Alternative 1 includes a variety of proposed improvements that are all located within a seismically active region. All proposed facilities are subject to potential ground shaking but none are likely to be affected by surface fault rupture. The potential for liquefaction or landslide hazards to impact the proposed facilities varies by location as described above. To minimize the potential for damage related to ground shaking and ground failure (including landslides and liquefaction), Los Vaqueros Dam and associated improvements (i.e. spillways, inlet/outlet works, Oxygenation System) would be designed and constructed in accordance with industry standard practices and other CCWD construction requirements. The foundations of other facilities including the new Delta Intake and Pump Station, conveyance facilities, powerlines, and recreational facilities would be designed in accordance with industry standard practices Pipelines would be designed to include flexible connections, where deemed necessary, along with backfill requirements that minimize the potential for significant damage. All other project buildings and structures would employ standard design and construction for structures using the most recent geotechnical practices and CCWD seismic criteria, which would provide conservative design criteria. Therefore, the potential impact from strong seismic ground shaking or seismic-related ground failure, including liquefaction and landslides, would be less than significant.

Alternative 2

This alternative would include all of the same facilities that are described above in the analysis for Alternative 1.

Alternative 3

This alternative would include all of the same facilities that are described above in the analysis for Alternative 1 with two exceptions. Alternative 3 does not include the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. These omissions would not result in any significant reduction of impacts related to seismic activity other than the fact that there would be overall less facilities constructed that would be at risk of damage following a significant earthquake. The expansion of the Old River Intake would occur within the existing facility site and therefore would require a reduced geotechnical engineering effort. The remaining proposed improvements under Alternative 3, as under Alternative 1, would be similarly constructed according to standard industry practices and CCWD building requirements that would reduce the potential impacts from seismic activity to less than significant levels.

Alternative 4

Alternative 4 would require significantly less construction of new facilities compared to Alternative 1. There would be no physical expansion of the Transfer Facility, no new Delta Intake and Pump Station, and no new pipelines or power supply infrastructure. The reduction in new construction would result in fewer improvements susceptible to the effects of seismic activity, and all improvements would be constructed according to CCWD construction standards that would reduce the potential impacts from seismic activity to less than significant levels. The dam and reservoir would still undergo expansion but would also be similarly constructed according to standard industry practices and CCWD construction requirements that would reduce the potential impacts from seismic activity to less than significant levels.

Mitigation: None required.

Impact 4.4.2: During construction and operations, the project could result in substantial soil erosion or the loss of topsoil. (Less than Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

The proposed expansion of Los Vaqueros Reservoir would require the excavation, transport, stockpiling, grading, drilling, blasting, and use of a substantial quantity of bedrock, alluvium, and soil obtained from the borrow area. Other activities include the demolition and removal of existing facilities within the inundation zone and the installation of support structures and new access roads. Equipment and vehicle staging areas would also be required. Construction activities with the potential for sediment delivery to Kellogg Creek include fill placement on the downstream face, the concrete plant and the fill stockpiles downstream of the dam. Also, a 15-acre stockpiling/staging area would be located downstream of the dam. If managed correctly, the soils disturbed by project earthwork and construction activities as well as stockpiled materials for use in the construction would not be susceptible to water induced erosion and loss of topsoil.

Once the new dam is constructed and the reservoir filled, shoreline erosion would occur along the zone of reservoir-elevation fluctuation. Sediment delivery into the reservoir resulting from shoreline erosion would be retained within the reservoir.

Delta Intake Facilities

Alternative 1 would include construction of a new Delta Intake and Pump Station. The new Delta Intake and Pump Station facility would include a water intake structure, pumping station facilities, a facilities building, a surge tank, and access road. Ground-disturbing activities within the 22-acre site would be required for site preparation and foundation construction of the proposed facility. The soils disturbed by earthwork and construction activities at this facility as well as stockpiled materials for use in the construction would be susceptible to the effects of wind or water induced erosion and loss of topsoil.

Conveyance Facilities

The conveyance facilities under Alternative 1 would include significant earthwork and grading activities during construction. Construction of the pipelines would primarily use the open-trench method; however, the Transfer-Bethany Pipeline also includes an approximately 0.8-mile or 1.5-mile tunneled section of pipeline. In areas where the proposed pipeline alignments would be located where there is little topographic variance, such as much of the Delta-Transfer Pipeline alignment, the potential for significant soil erosion is generally much lower. However, for other areas with steeper terrain, erosion potential is higher. Soils disturbed by earthwork and construction activities for these conveyance facilities as well as stockpiled materials for use in the construction would be susceptible to the effects of wind or water induced erosion and loss of topsoil.

Power Supply Infrastructure

Construction of the transmission lines and a substation under Alternative 1 would result in ground breaking activity under either of the two power options. A new substation would be developed under either Power Option 1 and 2 (a new Western substation near Camino Diablo under Option 1 and a new PG&E substation near the Transfer Facility under Option 2), and would involve permanent development of an approximately 2-acre site and a permanent access road. Construction of these facilities would require temporary grading and earthwork that would disturb subsurface soils where the new substation, access and power lines would be installed. Soils disturbed by earthwork and construction activities for these conveyance facilities as well as stockpiled materials for use in the construction would be susceptible to the effects of wind or water induced erosion and loss of topsoil.

Recreational Facilities

The construction of recreational facilities would require ground disturbance and earthwork. Soils disturbed by earthwork and construction activities for these conveyance facilities as well as stockpiled materials for use in the construction would be susceptible to the effects of wind or water induced erosion and loss of topsoil.

Summary

Construction of all the proposed improvements under Alternative 1 would include earthwork and grading activities that would disturb large volumes of soil. If not managed correctly, these soils could be susceptible to the effects of wind or water induced erosion and loss of topsoil would be a significant impact. The expanded inundation area, however, would not result in significant erosion based on past performance and the physical conditions which would contain any eroded materials.

Alternative 2

Alternative 2 would include all of the same facilities as in Alternative 1 and therefore potential erosion impacts would be the same as those described for Alternative 1. This impact is significant.

Alternative 3

Alternative 3 includes most of the same facilities that are described in Alternative 1 with two exceptions. Alternative 3 does not include the new Delta Intake and Pump Station or the Transfer–Bethany Pipeline. It does include expansion of Old River Intake and Pump Station, however this would not require any groundbreaking activities. Without the two facilities included in Alternative 1, the total amount of earthwork and grading activities would be reduced and result in an overall lower potential for total erosion and loss of topsoil. However, potential erosion and topsoil loss would be a significant impact.

Alternative 4

Alternative 4 would require significantly less construction of new facilities compared to Alternative 1. There would be no physical expansion of the Transfer Facility, no new Delta Intake and Pump Station, and no new pipelines or power supply infrastructure The proposed expansion of Los Vaqueros Reservoir to 160 TAF under this alternative would also require the excavation, transport, stockpiling, grading, drilling, blasting, and use of a substantial quantity of bedrock, alluvium, and soil however the total volume would be less. There also would be less recreational facility relocation and construction under this alternative. Although the total amount of earthwork activities and, consequently, the amount of soils exposed to erosion would be less under Alternative 4 compared to Alternative 1, the construction activities would still potentially expose soils to erosion, which would be a significant impact.

During operation of Alternative 4, the expanded reservoir would expose some soils to shoreline erosion along the zone of reservoir-elevation fluctuation, however as noted for Alternative 1, it is not expected to be significant. The 160 TAF expanded reservoir would have a shoreline of approximately 18.9 miles as opposed to the 24.7-mile shoreline under Alternative 1. Any sediment that erodes into the reservoir would be retained behind the dam.

Mitigation Measure

Implementation of mitigation hydrology measures (Measures 4.5.1a and 4.5.1b) and biological mitigation measures (Measures 4.6.2a and 4.6.2b) would reduce potential impacts of soil erosion and topsoil loss to a less-than-significant level. No additional measures would be required.

Impact Significance After Mitigation: These measures that control erosion and water quality of storm water runoff would be effective in reducing the potential for soil erosion and loss of topsoil to less than significant levels. Although these measures are primarily designed to prevent water quality impacts of receiving waters, they are achieved by reducing the potential for substantial erosion and loss of topsoil.

Impact 4.4.3: Project components could be located on expansive or corrosive soils or on a geologic unit or soil that is unstable or could become unstable as a result of the project or construction activities; however, those components would not likely result in onsite or offsite landslides, lateral spreading, subsidence, liquefaction, or collapse, and would not create substantial risks to life or property. (Less than Significant)

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

Landslides. The proposed modifications to the existing dam would include raising the dam crest to accommodate the reservoir expansion. Previous work at the dam site included removing unstable soils beneath the dam and placing the abutments on bedrock. The modifications to the dam would be similarly constructed on the Panoche Formation of sandstone and claystone (Wagner et al, 1990; Simpson and Schmoll, 2001). At the dam location, landslides have been identified and mapped (URS and MWH, 2004), however similar to the engineering design measures implemented for the existing Los Vaqueros Reservoir (Fraser, 2001b; Simpson and Schmoll, 2001), measures would be identified for any known or suspected slide areas, including excavation to a stable base and drainage improvements to maintain stability. Design of the dam, as required by DSOD must consider not only dynamic or seismic forces, as discussed above in Impact 4.4.1, but also static forces such as water pressure from reservoir storage, slope stability, and subsidence. With implementation of required dam design and engineering procedures there would not be a substantial risk to life or property associated with landslides at the dam or reservoir site.

Subsidence. The enlarged dam including all appurtenant facilities will be founded entirely on competent bedrock and consequently subsidence is not an issue.

Expansive soils. The enlarged dam including all appurtenant facilities will be founded entirely on competent bedrock and consequently expansive soils are not an issue.

Corrosive soils. The site soils are generally considered corrosive (Montgomery, 1992). The enlarged dam will be founded on bedrock and constructed largely with local materials; Panoche Formation claystone from the right abutment and alluvial clay from the valley floor. Materials imported to site such as the sands and gravels that comprise the dam's internal drainage system will be tested for pH prior to acceptance on the job as was done during construction of the existing dam. Any imported materials that are potentially corrosive will not be used in the dam. Corrosion protection of metal fixtures exposed to the reservoir water or groundwater will be addressed during design and could include cathodic protect, electrical isolation and the use of stainless steel. Therefore since the dam will be largely constructed of materials already present at the site, imported materials will be non-corrosive and design measures will be used to mitigate against corrosion, the potential for corrosion is at less than significant levels.

Delta Intake Facilities

Landslides. The proposed new Delta Intake and Pump Station would be just south of the existing Old River Intake and Pump Station along Old River. The topography of this area is relatively flat with little likelihood of any landslides affecting the proposed facilities. The new levee that would surround the facility would be designed in accordance with current CCWD construction requirements by state licensed professionals that would ensure stability.

Subsidence. The underlying geologic materials alongside Old River consist of soft alluvial sediments that are susceptible to subsidence if not engineered appropriately. Industry standard geotechnical measures such as surcharging or pre-loading soft materials to accelerate the compression or installation of a deep foundation system on deeper more competent materials are effective means to overcome the potential for subsidence.

Expansive soils. According to the Soil Survey for Contra Costa County, the area of the proposed Delta Intake and Pump Station is shown as underlain by Kingile Muck. These deposits are considered to have a high expansion potential (Welch, 1977). The geotechnical measures incorporated to address subsidence would also be effective in reducing the potential for expansive soils to impact any new intake facilities.

Corrosive soils. The native soils at the new Delta Intake and Pump Station are mapped as Rindge and Kingile soils which have a very high potential for corrosivity. However, modern construction materials and other engineering controls such as cathodic protection and use of engineered fills would effectively reduce the potential for corrosion to less than significant levels.

Conveyance Facilities

Landslides. The conveyance facilities would be located over a range of topographic environments from the lowlands of the Delta-Transfer Pipeline to the steeper terrain associated with the Transfer–LV Pipeline and Transfer-Bethany Pipeline. Generally, the installation of pipelines does not represent significant loads that can cause an otherwise stable geologic unit to result in a landslide. However, during construction, the disturbance from earthwork activities can potentially trigger slope failures if not engineered appropriately.

Subsidence. The various conveyance facilities proposed cover a wide range of soils and bedrock that would include some soft alluvial sediments susceptible to subsidence if not engineered appropriately. Industry standard geotechnical measures such as placement of compacted backfill surrounding the pipeline is an effective means to overcome the potential for subsidence.

Expansive soils. The conveyance facilities would be located across a range of soils having a range of expansion potential including those with a high expansion potential (Welch, 1977). Common geotechnical practices such as the placement of compacted engineered fill with a low expansion potential is effective in reducing the potential for expansive soils to impact any new intake facilities.

Corrosive soils. Previous soil surveys in both Contra Costa County and Alameda County have indicated that native soils with high corrosive potential are located throughout the project area. However, modern construction materials and other engineering controls such as cathodic protection and use of engineered fills would effectively reduce the potential for corrosion to less than significant levels.

Power Supply Infrastructure

Landslides. The majority of the power supply improvements such as the power lines and expanded Transfer Facility are located in areas that are either relatively flat or within gently rolling hills. The potential for landslides to affect the power supply infrastructure under either power option is low. In addition, both Western and PG&E have internal construction standards that must meet the requirements of the California Public Utilities Commission as well as the IBC.

Subsidence. The proposed new Western substation would be located in clayey alluvial soils of the Sacramento soils unit whereas the PG&E substation would be located in the Altamont soils unit. The proposed power supply lines would cover a range of different soil units. Depending on site specific conditions, these soils could potentially be susceptible to subsidence. The Western substation location is likely to have a greater potential considering its location that is closer to the thick alluvial deposits of the valley floor. However, the potential for subsidence would be part of the industry standard analysis of geologic hazards. Industry standard geotechnical measures such as replacement of compacted backfill in the upper soil layer is an effective means to overcome the potential for subsidence. In addition, both Western and PG&E have internal construction standards that must meet the requirements of the California Public Utilities Commission as well as the IBC.

Expansive soils. Both the Altamont and Sacramento soils units have a high potential for expansion or shrink-swell characteristics. Common geotechnical practices and industry standards for installation of power poles such as the placement of compacted engineered fill with a low expansion potential is effective in reducing the potential for expansive soils to impact any new intake facilities.

Corrosive soils. Corrosive soils generally do not impact power poles and the substation improvements would be located on a foundation pad that would not be significantly impacted by corrosivity. Use of engineered fills would also be effective in reducing the potential impact from any corrosive soils, if present.

Recreational Facilities

Landslides. If rapid landsliding occurred due to either heavy precipitation or construction activities, recreational facilities or users could be exposed to landslide hazards if not given geotechnical engineering considerations. However, the proposed recreation facilities would not be located in an area where this risk would be likely to occur. The proposed recreational facilities are located in areas that are relatively flat or are not within known landslides or debris flows (Ellen et al., 1997; Pike, 1997). In addition, the geotechnical investigations required for the design of these improvements would require an analysis of the potential landslide hazard and implementation of measures to minimize risks to structures and people.

Subsidence. The majority of the proposed recreational facilities would be located on relatively thin soils above competent bedrock. The probability of subsidence in these areas is low; however, as is standard practice for the design of such structures, the site specific characteristics of the underlying materials would be evaluated. There is likely a greater potential for subsidence in the soft sediments within the reservoir where the fishing pier would be located. However, the piers would be anchored to more competent materials at depth which would mitigate the potential for subsidence to occur.

Expansive soils. All of the recreational facilities would be located on the Altamont soils association which has a high potential for expansion or shrink-swell characteristics. Some of the proposed facilities such as picnic areas and restrooms would likely be too light to be significantly impacted by expansive soils. Nonetheless, common geotechnical practices and industry standards for construction such as the placement of compacted engineered fill with a low expansion potential is effective in reducing the potential for expansive soils to impact any new Recreational Facilities.

Corrosive soils. The proposed recreational facilities generally do not include any elements such as pipelines that would be impacted by corrosive soils. Regardless, the use of engineered fills would also be effective in reducing the potential impact from any corrosive soils, if present.

Summary

The project area includes areas with soils and geologic units that have a potential for becoming unstable or causing damage if not appropriately engineered. Areas around the dam have the potential for landslides, the soft thick sediments of the valley floor, especially adjacent to Old River have a high potential for subsidence, and across the entire study area there are native soil units that are considered by the Soil Conservation Service to have a high potential for expansion and corrosion. All proposed improvements would require the initial preparation of a site specific geotechnical investigation which would identify potential geologic hazards such as landslides, subsidence and expansive/corrosive soils. Adherence to CCWD construction requirements and industry standard geotechnical practices would reduce potential impacts to a less-than-significant level.

Alternative 2

Proposed facilities and improvements under Alternative 2 would be the same as in Alternative 1. The proposed improvements would be constructed according to industry standard practices, and CCWD construction standards, that would reduce the potential impacts from seismic activity to less than significant levels.

Alternative 3

Alternative 3 includes most of the same facilities that are described in Alternative 1 with two exceptions. Alternative 3 does not include the new Delta Intake and Pump Station or the Transfer–Bethany Pipeline. This alternative does include expansion of the Old River Intake and Pump Station, however the expansion will not require groundbreaking activities and therefore would not be impacted by expansive soils. The remaining proposed improvements under Alternative 3, as under Alternative 1, would be similarly constructed according to industry standard practices, and CCWD construction standards that would reduce the potential impacts from unstable soils or geologic units to less than significant levels.

Alternative 4

Alternative 4 would require less construction of new facilities compared to Alternative 1. There would be no physical expansion of the Transfer Facility, no new Delta Intake and Pump Station, and no new pipelines or power supply infrastructure. This alternative also requires less relocation and construction of new recreation facilities. The project area includes areas with soils and geologic units that have a potential for becoming unstable or causing damage if not appropriately engineered. Areas around the dam have the potential for landslides. All proposed improvements would require the initial preparation of a site specific geotechnical investigation which would identify potential geologic hazards such as landslides, subsidence and expansive soils. Adherence to CCWD construction requirements and industry standard geotechnical practices would reduce potential impacts to a less-than-significant level.

Mitigation: None required.

Cumulative Effects

Impact 4.4.4: The proposed project would not make a cumulatively considerable contribution to cumulative effects associated with erosion, topsoil loss or increased exposure to seismic or other geohazard risks. (Less than Significant)

Under all alternatives, surface areas disturbed during construction would be restored – either re-vegetated, compacted and/or paved. Cumulative erosion effects might arise if other projects would be constructed near and at the same time as the proposed Los Vaqueros Reservoir Expansion Project facilities. As summarized on Table 4.1-2, while there are no projects proposed adjacent to project facility sites, there are other projects proposed in the region that might be under construction at the same time as the Los Vaqueros Reservoir Expansion Project facilities. However, like the Los Vaqueros Reservoir Expansion Project, most of these projects will be required to implement site-specific erosion control and water quality control measures as required by state law. These water quality regulations are intended to effectively reduce water quality impacts from each construction site such that significant cumulative effects do not arise. With implementation of proposed mitigation measures to implement appropriate erosion and water quality control during construction (Mitigation Measures 4.5.1a and b, as well as biological mitigation measures 4.6.2a and 4.6.2b), the Los Vaqueros Reservoir Expansion would not make a cumulatively considerable contribution to cumulative water quality effects.

The Los Vaqueros Reservoir Expansion Project would affect topsoil in select areas (i.e., the 160 TAF core borrow area and within the area of pipeline trenching). Other effects such as the potential to destabilize soils are site specific and do not overlap with effects at other sites outside the project area. For this reason, although other projects in the region might remove or cover topsoil with impervious surfaces (primarily large residential developments such as the proposed Cecchini Ranch), the project would not make a cumulatively considerable contribution to cumulative effects on topsoil.

Mitigation: None required.

4.5 Local Hydrology, Drainage, and Groundwater

This section describes surface hydrology, flooding condition, and groundwater resources within the watersheds of Contra Costa and Alameda Counties that would be potentially affected by facility construction and operation proposed under the project alternatives for the Los Vaqueros Reservoir Expansion Project. This section also presents the applicable regulatory background; an assessment of potential hydrologic, drainage, flood, and groundwater effects; and, where appropriate, suitable mitigation to reduce potentially significant impacts to a less-than-significant level. This section includes discussion of effects on Delta hydrology, drainage, and groundwater from project construction. Effects on Delta hydrology and water quality from operations, including operations of the Central Valley Project and State Water Project, are described in Section 4.2, Delta Hydrology and Water Quality. Effects on Delta fisheries and aquatic resources from both construction and operations are described in Section 4.3, Delta Fisheries and Aquatic Resources. Additionally, potential water-related effects of the proposed project with regard to climate change, and the potential for climate induced changes to affect the proposed project operations, are discussed in Chapter 5.0, Climate Change.

4.5.1 Affected Environment

Regulatory Setting

The following federal, state, and local agencies and statutory authorities relevant to hydrology, drainage, and groundwater are applicable to the proposed project.

Federal

Executive Order 11988

Under Executive Order 11988, FEMA is responsible for managing floodplain areas, which are defined as the lowland and relatively flat areas adjoining inland and coastal waters subject to a 1 percent or greater chance of flooding in any given year (the 100-year floodplain). FEMA requires that local governments covered by federal flood insurance pass and enforce a floodplain management ordinance that specifies minimum requirements for any construction within the 100-year floodplain.

Clean Water Act

The Clean Water Act established the basic structure for regulating discharges of pollutants into "waters of the United States." The act specifies a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff.

Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged and fill material into waters of the U.S., including some wetlands. Activities in waters of the U.S. that are regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry.

Section 401 requires every applicant for a federal permit or license for any activity that may result in a discharge to a water body to obtain a water quality certification that the proposed activity will comply with applicable water quality standards.

Section 402 regulates point- and nonpoint-source discharges to surface waters through the National Pollutant Discharge Elimination System (NPDES) program. In California, the SWRCB oversees the NPDES program, which is administered by the Regional Water Quality Control Boards (RWQCBs). The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits.

Construction of the proposed project, including construction of the proposed intake facilities, pipelines, expanded reservoir, appurtenant facilities, and other associated facilities, would be subject to regulation under Sections 401, 402, and/or 404 of the Clean Water Act.

Rivers and Harbors Act

The U.S. Army Corps of Engineers (USACE) regulates the construction of any structure or work within navigable waters under Sections 9 and 10 of the Rivers and Harbors Act. The USACE regulates the construction of wharves, breakwaters, and jetties; bank protection and stabilization projects; permanent mooring structures, vessels, and marinas; intake and outfall pipes; canals; boat ramps; aids to navigation; and other modifications affecting the course, location, condition, and capacity of navigable waters. The USACE jurisdiction under the Rivers and Harbors Act is limited to "navigable waters," or waters subject to the ebb and flow of the tide shoreward to the mean high water mark that may be used for interstate or foreign commerce. The USACE must consider the following criteria when evaluating projects within navigable waters: (1) the public and private need for the project; (2) reasonable alternative locations and methods; and (3) the beneficial and detrimental effects on the public and private uses to which the area is suited. The Rivers and Harbors Act is applicable to the proposed intake.

State

California Department of Water Resources, Division of Safety of Dams

Division 3 of the California Water Code—the statute governing dam safety in California—places responsibility for the safety of non-federal dams and reservoirs under the jurisdiction of the California Department of Water Resources (DWR) Division of Safety of Dams (DSOD). DSOD sets performance standards and regulates the construction of all dams 25 feet and higher that impound over 0.015 TAF (4.9 million gallons) of water, or over 6 feet high that impound over 0.05 TAF (16.3 million gallons) of water. DSOD's engineers and engineering geologists provide multiple critical reviews of new dams as well as for the enlargement and alteration of existing dams in order to ensure that their stringent performance standards are adhered to. Detailed DSOD standards address the site geology, seismic setting, site geotechnical investigations, laboratory testing, proposed construction materials, seismic analyses, and design of the dam. They also oversee construction to verify compliance with the approved construction documents, and approve foundations before material is placed.

Before water can be impounded behind a new dam, DWR must issue a certificate of approval to operate. These certificates may contain restrictive conditions and may be amended or revoked. DSOD engineers inspect existing dams on a yearly schedule to ensure they are performing safely and are being adequately maintained. Operating dams are also periodically inspected to assure they are adequately maintained, and to direct the owner to correct any deficiencies that are found.

Porter-Cologne Water Quality Control Act

Under the Porter-Cologne Water Quality Control Act, water quality objectives are limits or levels of water quality constituents or characteristics established for the purpose of protecting beneficial uses. The Act requires the RWQCBs to establish water quality objectives while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, also constitute water quality standards under the federal Clean Water Act. Therefore, the water quality objectives form the regulatory references for meeting state and federal requirements for water quality control. A change in water quality is only allowed if the change is consistent with the maximum beneficial use of the waters of the state, would not unreasonably affect the present or anticipated beneficial uses, and would not result in water quality lower than that specified in applicable water quality control plans (CVRWQCB, 2007). All aspects of the proposed project would be subject to the Porter-Cologne Water Quality Control Act.

Basin Plans and Water Quality Objectives

The Porter-Cologne Water Quality Control Act provides for the development and periodic review of water quality control plans (referred to as basin plans) that designate beneficial uses of California's major rivers and groundwater basins and establish narrative and numerical water quality objectives for those waters. Beneficial uses represent the services and qualities of a water body (i.e., the reasons why the water body is considered valuable), while water quality objectives represent the standards necessary to protect and support those beneficial uses. Basin plans are primarily implemented through the NPDES permitting system and by issuing waste discharge regulations to ensure that water quality objectives are met.

Basin plans provide the technical basis for determining waste discharge requirements and taking regulatory enforcement actions if deemed necessary. The project area is located within the jurisdiction of the Central Valley RWQCB[1]. A basin plan has been adopted for the Sacramento and San Joaquin River Basin (Region 5; CVRWQCB, 2007), which covers all of the project area.

The Region 5 Central Valley RWQCB has set water quality objectives for the surface waters in its region for the following substances and parameters: ammonia, bacteria, biostimulatory substances, chemical constituents, color, dissolved oxygen, floating material, oil and grease, pH, radioactivity, salinity, sediment, settleable material, suspended material, taste and odor, temperature, toxicity, turbidity, and pesticides. Specific objectives for concentrations of chemical constituents are also

1 The boundary line between the Central Valley RWQCB jurisdiction and the San Francisco Bay RWQCB lies just west of the Los Vaqueros Watershed in eastern Contra Costa County. Therefore, while most of the county is governed by the SF RWQCB, the Los Vaqueros Reservoir Expansion Project area is under Central Valley RWQCB jurisdiction.

applied to bodies of water based on their designated beneficial uses (CVRWQCB, 2007). For groundwater, water quality objectives applicable to all groundwater have been set for bacteria, chemical constituents, radioactivity, taste, odors, and toxicity (CVRWQCB, 2007).

General Construction Stormwater NPDES Permit

As mentioned above, the Central Valley RWQCB administers the NPDES stormwater permitting program in the Central Valley Region for construction activities. Construction activities disturbing one acre or more of land are subject to the permitting requirements of the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (General Construction Permit). For qualifying projects, the project applicant must submit a Notice of Intent to the RWQCB to be covered by the General Construction Permit prior to beginning construction. The General Construction Permit requires the preparation and implementation of a stormwater pollution prevention plan (SWPPP), which must also be completed before construction begins. Implementation of the SWPPP starts with the commencement of construction and continues through the completion of the project. Upon project completion, the applicant must submit a Notice of Termination to the RWQCB to indicate that construction is completed.

The proposed project will cause a disturbance area associated with construction of the proposed project that would exceed the one-acre threshold, therefore CCWD will be required to obtain a General Construction Permit from Central Valley RWQCB which will include preparing and implementing a SWPPP for all phases of construction.

Dewatering Discharges to Surface Waters Permit

The Central Valley RWQCB's Order No. 5-00-175, "Waste Discharge Requirements General Order for Dewatering and Other Low Threat Discharges to Surface Waters," provides that such discharges shall meet (1) effluent limitations criteria related to biological oxygen demand (BOD), total suspended solids, settleable solids, chlorine, pH, and flow; (2) solids disposal requirements related to screenings and other solids removed from liquid wastes; and (3) receiving water limitations related to dissolved oxygen concentration; oils, greases, waxes, and other materials that can form visible films on the water surface or streambed; constituents, including floating material and suspended material, that would create a nuisance or adversely affect beneficial uses; discoloration; fungi, slimes, and other objectionable growths; increases in turbidity; pH; deposition of materials; changes in temperature; taste and odor-producing substances; radionucleides; degradation of aquatic communities or biota; toxic pollutants in water, sediment, or biota; and other violations of water quality standards. Construction of pipelines and other proposed facilities where dewatering of sediments is necessary would require compliance with Order No. 5-00-175.

Streambed Alteration Agreement Program

Under Sections 1600–1616 of the California Fish and Game Code, any person, business, state or local government agency, or public utility that proposes an activity that would (1) substantially divert or obstruct the natural flow, (2) substantially modify the bed or bank of any river, stream, or lake, or (3) deposit or dispose debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake, is required to notify the California

Department of Fish and Game. The streambed alteration agreement that the notifying entity and Department of Fish and Game execute after such notification identifies potential impacts of construction and mitigation measures required to minimize and avoid impacts. All portions of the proposed project that would alter a waterway as summarized above, including the proposed intake, pipelines in areas of stream crossings, and the proposed reservoir expansion, would be subject to the Streambed Alteration Agreement Program.

State Reclamation Board Approval

Any project encroaching into rivers, waterways, and floodways within and adjacent to federal-and state-authorized flood control projects or within designated floodways must receive approval from the state Reclamation Board. Under California Water Code Sections 8534, 8608, and 8710–8723, the Reclamation Board is required to enforce, within its jurisdiction, on behalf of the State of California, appropriate standards for the construction, maintenance, and protection of adopted flood control plans that will best protect the public from floods. The Reclamation Board's jurisdiction encompasses the entire Central Valley, including all tributaries and distributaries of the Sacramento and San Joaquin Rivers and Tulare and Buena Vista Basins. The Reclamation Board exercises jurisdiction over the levee section, the waterside area between project levees, a 10-foot-wide strip adjacent to the landward levee toe, the area within 30 feet of the top to the banks with no levees, and within designated floodways adopted by the Reclamation Board. Construction of the proposed intake structure and the proposed reservoir expansion would be subject to state Reclamation Board approval.

Local

Contra Costa County General Plan

The Contra Costa County General Plan provides goals and polices related to the management of water resources within the county. These goals and policies include the protection of surface water supplies (7-H); requirements for drainage (7-Q); risk management in relation to flood control (10-G); and the control of nonpoint sources of water pollution (10-K). A detailed list of the County General Plan goals and policies relevant to local hydrology is located in Appendix E.

Contra Costa County Stormwater Management and Discharge Control Ordinance

Contra Costa County Stormwater Management and Discharge Control Ordinance No. 2005-01 was adopted to comply with the requirements of Provision C.3 of the County's NPDES Stormwater Permit, issued by the RWQCB. Contra Costa County lies within both the San Francisco and Central Valley regions and therefore complies with both regions depending on the location of the project. The proposed project lies entirely within the Central Valley Regional Water Quality Control Board jurisdiction and would comply with its regulations**.** Although CCWD would not process its stormwater permit through the County, the County ordinance is reviewed here for relevant policies and guidelines.

The County permit requires the implementation of source control and site design measures for all new construction projects that create more than an acre (43,560 square feet) of impervious surface. In August 2006, this surface coverage threshold was reduced to 10,000 square feet. The fundamental goals of the County ordinance are:

- Eliminating, to the maximum extent practical, illicit discharges to the stormwater system that could degrade the water quality of local streams
- Minimizing increases in nonpoint-source pollution caused by stormwater runoff from development that could degrade local water quality
- Controlling discharges to the county's stormwater system resulting from spills, dumping, or the disposal of materials other than stormwater
- Reducing stormwater runoff rates and volumes and nonpoint-source pollution whenever possible through stormwater management controls and by ensuring that the management controls are properly maintained and pose no threat to public safety
- Promoting the "no adverse impact" policies developed by FEMA and the Association of State Floodplain Managers, to the maximum extent practical, in an effort to minimize the adverse impacts of new development on stormwater quality and quantity

Contra Costa County Flood Control and Water Conservation District

The Contra Costa County Flood Control and Water Conservation District (FCWCD) is empowered to control flooding and stormwater within its service area. The FCWCD is staffed by the County Flood Control Engineering Division staff, with the purpose of developing and implementing storm drainage systems in Contra Costa County.

Alameda County

The East County Area Plan of the Alameda County General Plan also includes goals and policies related to the protection of surface water and groundwater quality. These goals and policies include the provision of a safe, reliable and efficient water supply (243); ensuring the mitigation of impacts on water quality caused by development near agricultural lands (76); and the encouragement of groundwater users to limit the withdrawal of groundwater (307). Specific goals and policies are listed in Appendix E.

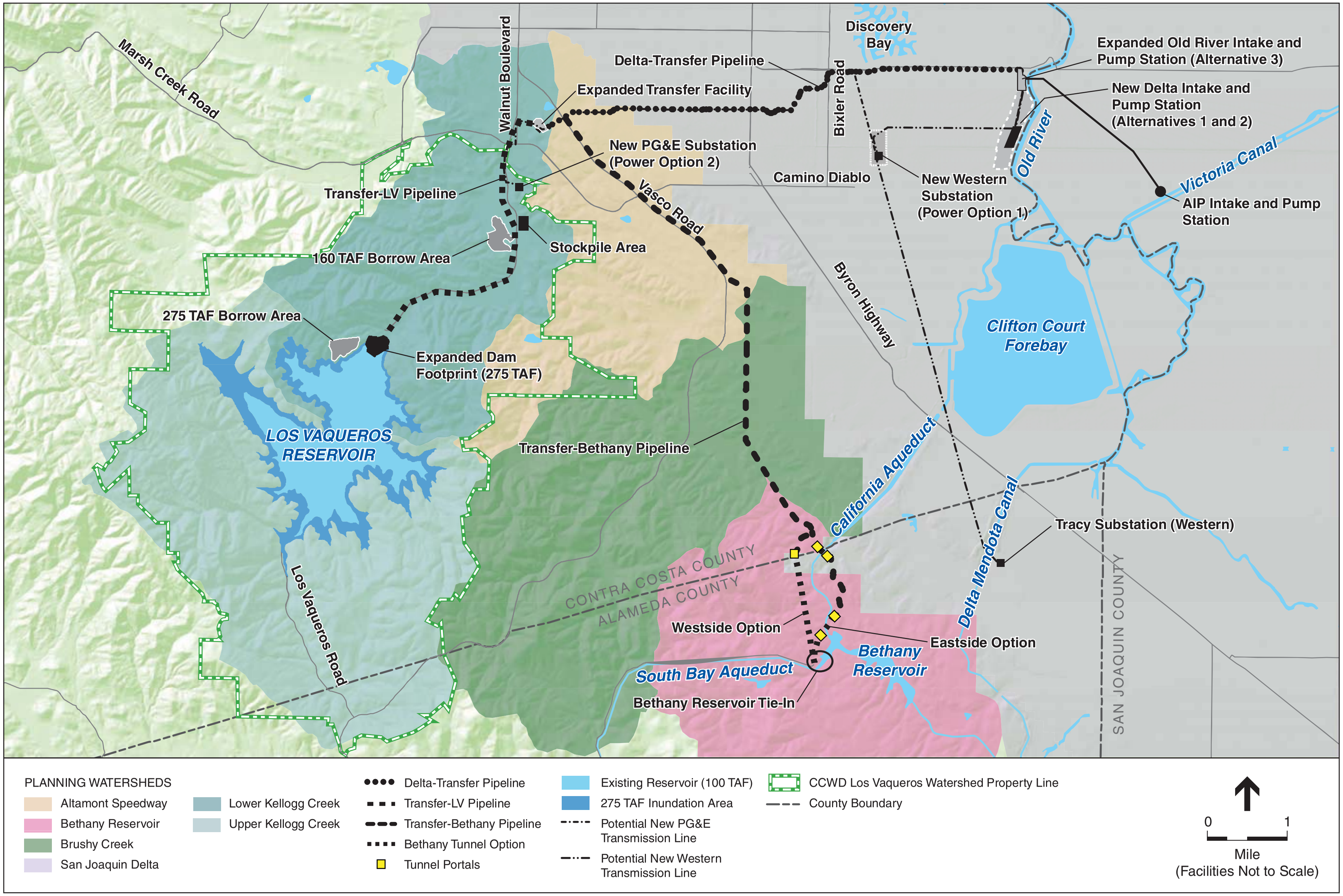
Environmental Setting

The existing environmental conditions related to hydrology, soils, potential flooding, groundwater, and water quality in the project area are described below.

Hydrology

Surface Hydrology

Los Vaqueros Reservoir is located within the North Diablo Range Hydrologic Area (U.S. Geological Survey Cataloging Unit No. 187040003), which drains into the larger Sacramento–San Joaquin Delta near Old River. **Figure 4.5-1** shows the local planning watersheds within the project region. The Los Vaqueros Watershed lies within the larger Kellogg Creek watershed. Proposed project facilities outside of the watershed would be located in each of the four other



SOURCE: USGS, 1993 (base map); and ESA, 2008

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Figure 4.5-1
Planning Watersheds

local planning watersheds occurring in the project region. Within the Kellogg Creek watershed, hydrologic conditions exist which support sensitive seasonal wetlands. A brief description of each planning watershed area is provided below.

Kellogg Creek Watershed. Kellogg Creek, the primary surface water body in the Los Vaqueros Reservoir watershed other than the reservoir itself, extends across the majority of the watershed. It runs from south to north through the middle of the watershed, flows into the south end of the Los Vaqueros Reservoir, and then out the north side through the existing dam. In the downstream reaches of the watershed (outside of CCWD's Los Vaqueros Watershed), the creek traverses an alluvial fan prior to entering the Delta. This reach of Kellogg Creek was realigned and channelized as agricultural and urban development progressed through the area.

Kellogg Creek drains an area of approximately 18,220 acres, of which about 10,528 acres are located upstream of the existing Los Vaqueros Dam. Water features that drain into Kellogg Creek upstream of Los Vaqueros Dam include Mallory, Adobe, Savanna, Silva, and Horseshoe Creeks. Below the dam, Mariposa, Kit Fox, Eagle, and Buckeye Canyon Creeks converge with Kellogg Creek. Downstream of the reservoir, Kellogg Creek parallels Vasco Road. East of Vasco Road, Kellogg Creek becomes channelized, and eventually enters Discovery Bay and Indian Slough.

All streams in the watershed are intermittent, although isolated pools remain in creek beds during drier periods. A number of stock ponds replenished by springs or runoff can be found within the watershed. With the attenuating effect of the existing dam, the 100-year peak runoff in lower Kellogg Creek would be about 150 cfs (CH2M Hill, 2002). A simulated hydrologic study spanning 70 years (from 1920 to 1990) found an average annual inflow of 1,290 acre-feet into the reservoir, with maximum and minimum annual inflows of 8,500 acre-feet and 100 acre-feet, respectively (CH2M Hill, 2002). On average, Kellogg Creek yearly inflow is 1,290 acre-feet, or 1.3 percent of the volume of the reservoir.

In order to meet downstream water rights on Kellogg Creek, including a requirement with Houston Orchards, flow is maintained in the creek downstream of the dam to match the flow entering the reservoir at the south end, up to a maximum release of 5 cfs or approximately 0.01 TAF per day (CH2M Hill, 2002).

Brushy Creek Watershed. Brushy Creek is a perennial stream that flows to a slow trickle or subsurface flow during the late summer and early fall seasons, and drains an area of approximately 16,346 acres. The headwaters of Brushy Creek start in Alameda County near the eastern flank of Brushy Peak and flow to the north. Several unnamed spring-fed streams converge with Brushy Creek north of the Contra Costa/Alameda County line. The lower reach of Brushy Creek enters an alluvial plain near the Byron Airport. East of the airport, Brushy Creek enters Italian Slough, which meanders north along the western perimeter of Clifton Court Forebay, towards Old River. Directly west of Armstrong Road, approximately three berms have been constructed that capture a portion of the upgradient surface water before crossing Armstrong Road. These berms may have been constructed to rehabilitate vernal pool habitat within the vicinity of Byron Airport west of the road.

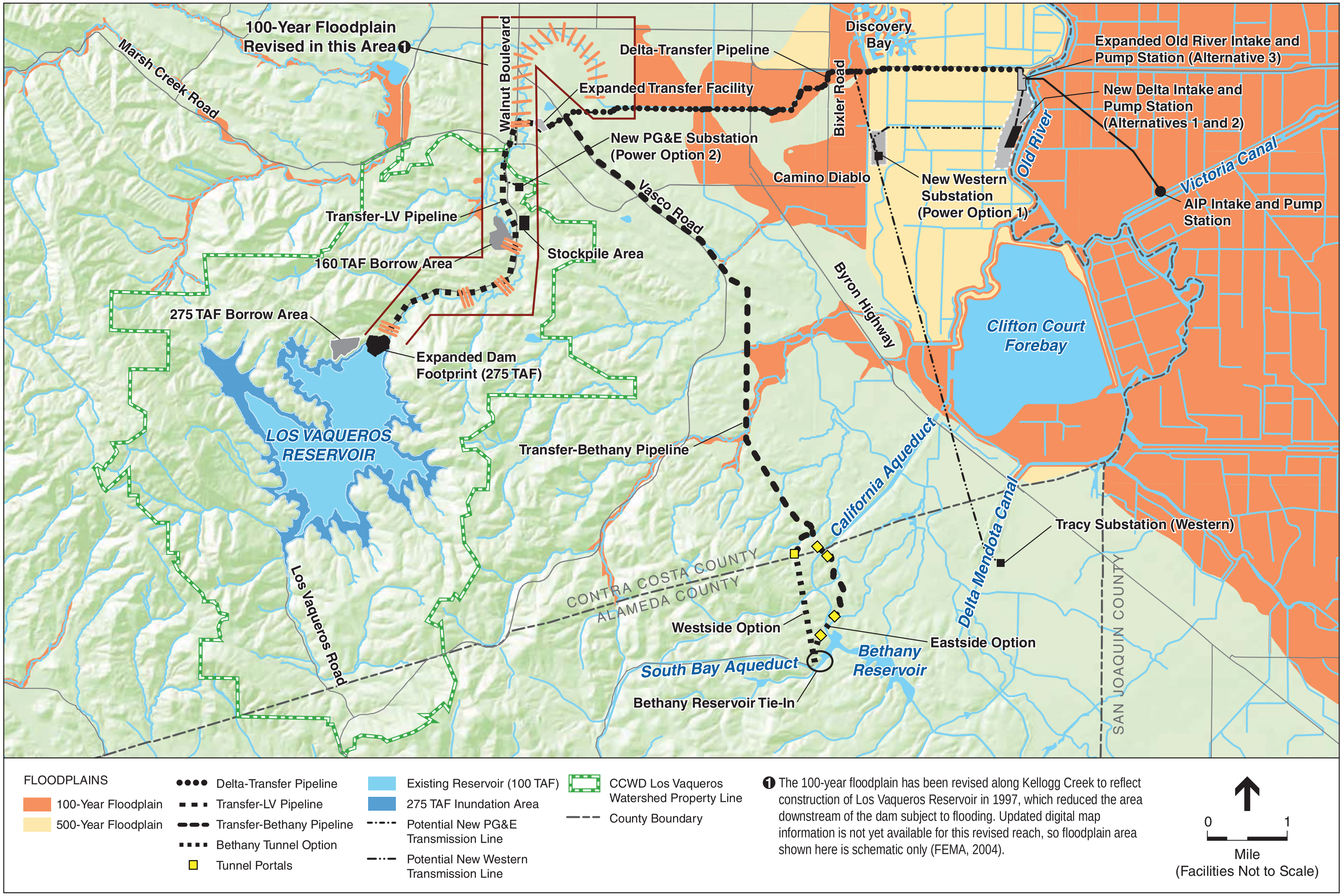
San Joaquin Delta Watershed. The San Joaquin River is the second longest river in the state and its confluence with the Sacramento River constitutes what is commonly referred to as the Delta. Originally blanketed by peat and peaty alluvium deposited from streams originating from the Sierra Nevada, Coast Ranges, and southern Cascade Range, this freshwater tidal marsh area now includes large agricultural resources. The San Joaquin Delta waters combine with the Sacramento River before eventually flowing westward and entering the San Francisco Bay system. The San Joaquin Delta is a huge source of water supplies for the Bay Area as well as San Joaquin Valley and parts of Southern California. As a result of the agricultural land uses and irrigation needs, much of the area includes surface water irrigation ditches and drainage canals. The ditches and canals are generally oriented parallel and perpendicular to roads and levees within the project area, such as Byron Tract Road and Armstrong Road. The canals are operated by local entities such as the Byron-Bethany Irrigation District. See also Section 4.2 Delta Hydrology and Water Quality for further description and discussion of the San Joaquin Delta.

Altamont Speedway Watershed. The Altamont Speedway Watershed is located between the Brushy Creek Watershed and the Lower Kellogg Creek Watershed. As a subregion to the Kellogg Creek Watershed, all ephemeral and perennial streams or drainages eventually enter Kellogg Creek. However, these drainages generally have very little or no flow outside of the rainy season. Most of these drainages are unnamed. The Altamont Speedway Watershed also contains some geothermal springs known as the Byron Hot Springs.

Bethany Watershed. Bethany Watershed is not a subregion to the Kellogg Creek Watershed and is located to the south of the Brushy Creek Watershed. Most of the watershed is located within Alameda County but the north portion does cross into Contra Costa County. Similar to the other watersheds mentioned above, many unnamed ephemeral and perennial streams drain the watershed with little flow outside of the rainy season. All of the drainages empty into Bethany Reservoir, which is located on the California Aqueduct. The reservoir is also used as a forebay for the South Bay Aqueduct.

Flood Potential

The Federal Emergency Management Agency (FEMA) provides information on flood hazard and frequency for cities and counties on its Flood Insurance Rate Maps (FIRM). FEMA identifies designated zones to indicate flood hazard potential. In general, flooding occurs along waterways, with infrequent localized flooding also occurring due to constrictions of storm drain systems or surface water ponding. The Flood Insurance Rate Maps for Contra Costa County, including the project area, were originally published prior to the completion of Los Vaqueros Reservoir. However, the 100-year floodplain along Kellogg Creek has been updated by FEMA to account for the attenuating effects of the existing 100 TAF reservoir, with the revised floodplain shown in a Letter of Map Revision dated March 24, 2004. Areas west of Byron Highway are generally outside the FEMA 100-year floodplain, except for the immediate channels of Kellogg and Brushy Creeks (see **Figure 4.5-2**). East of Byron, much of the land area is situated within the 100-year or 500-year floodplain of the Delta, and no base flood elevation has been determined.



SOURCE: USGS, 1993 (base map); ESRI, 2006; and ESA, 2008

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Figure 4.5-2
100- and 500-Year Floodplains

A portion of the area downstream of Los Vaqueros Dam is subject to potential inundation from emergency reservoir releases that currently reach up to 1,140 cfs and 2430 cfs if the reservoir were expanded to the proposed 275 TAF. In the rare event that such releases might occur (although none have occurred to date), the lands adjacent to Kellogg Creek could be subject to inundation during the releases. Because the lands downstream of Walnut Boulevard are very flat, it is not practical to delineate the potential flood zone without very accurate topographic surveying of the lower watershed. It is expected, however, that floodwaters would spread outward from Kellogg Creek at a depth of about 6 inches until an obstruction or other feature was encountered. This zone could extend about 2,000 feet laterally from the creek channel. Obstructions such as the Burlington Northern Santa Fe Railway line could impede floodwater movement, resulting in the development of ponds and backwaters.

Groundwater

The majority of the project area is located outside of any defined groundwater basins, but the eastern lowland portion of the project area (generally the San Joaquin Delta Watershed) is located within the Tracy groundwater subbasin (Basin Number: 5-22.15) of the San Joaquin Groundwater Basin. This subbasin is defined by the unconsolidated and semiconsolidated sedimentary deposits bounded by the Diablo Range to the west, the Mokelumne River to the north, the San Joaquin River to the east, and Stanislaus County to the south (DWR, 2004). The Tracy Subbasin is drained by the San Joaquin River as well as Corral Hollow Creek, a tributary. The water bearing deposits range from about a few hundred feet below ground surface near the Diablo Ranges (in the vicinity of the project area) to about 3,000 feet along the eastern margin of the basin. To the west of the Tracy subbasin, groundwater can be found in stress fractures, joints, and faults in a series of sedimentary rock formations (sandstone, siltstone, claystone) that vary in thickness. Groundwater movement is influenced by the characteristics of the fracture system, including the size and location of fractures, the interconnection between fractures, and the materials within the fracture.

Groundwater recharge areas likely occur beneath the ephemeral creeks that cross the project area, although groundwater recharge from the existing reservoir appears to be limited. While the existing dam does not cut off all seepage of groundwater into the lower Kellogg Creek, extensive grouting prevents most groundwater seepage. An existing downstream blanket drain collects seepage at a flow rate of approximately 15 gallons per minute during periods of full reservoir storage. Assuming that this is approximately one-third of the total seepage flow beneath the dam, only about 30 gallons per minute of reservoir water are available to recharge localized groundwater.

In general, depths to groundwater in the areas east of Byron Highway range from less than 3 feet to 20 feet below the ground surface for the period of record (DWR, 2007). However, no soil excavations have been completed to confirm these water levels along the project alignment. Nonetheless, groundwater levels in this area are regulated by a series of agricultural drains, irrigation ditches, and continuous pumping stations and are therefore expected to remain relatively constant on a seasonal and annual basis.

Tsunamis and Seiches

Tsunamis are earthquake-generated displacements of water resulting in a rise or mounding at the ocean surface that moves away from the center as a sea wave. Because the project is located 30 miles east of the Pacific Ocean, tsunamis are not considered a potential impact issue.

Seiches are large-scale waves of long wave length in a closed body of water such as a lake or reservoir. Depending on the location of the water body, seiches might be generated by fault rupture that displaces one side of the water body relative to the other and set up the oscillatory waves; these waves may be up to several feet in height. Since there is no known active fault below the Los Vaqueros Reservoir, the potential for an earthquake induced seiche is remote.

4.5.2 Environmental Consequences

Methodology

This section identifies hydrologic, floodplain management, and groundwater issues that are relevant to the proposed project. The impact analysis identifies foreseeable changes in existing conditions based on the significance criteria presented below, and provides an individual discussion for each project component in the context of construction, offsite staging areas, and post-construction operation.

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant hydrologic, drainage, or groundwater impact if it would:

- Violate any water quality standards or waste discharge requirements, or otherwise substantially degrade water quality;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
- Substantially alter the existing drainage pattern of the site or project area in a manner that would cause substantial erosion and sedimentation and/or flooding onsite or offsite;
- Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- Place people or structures within a 100-year flood hazard area which could impede or redirect flood flows; or

- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam or inundation by seiche, tsunami, or mudflow.

Impact Summary

Table 4.5-1 provides a summary of the impact analysis for issues related to local hydrology, drainage, and groundwater based on actions outlined in Chapter 3.

TABLE 4.5-1
SUMMARY OF IMPACTS – LOCAL HYDROLOGY, DRAINAGE, AND GROUNDWATER

	Project Alternatives			
Impact	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.5.1: During construction, the project alternatives could violate water quality standards through increased erosion and sedimentation to local waterways, release of fuels or other hazardous materials during construction, or dewatering of excavated areas that could result in substantial water quality degradation.	LSM	LSM	LSM	LSM
4.5.2: Construction and operation of the project alternatives would not deplete local groundwater supplies or interfere with groundwater recharge.	LS	LS	LS	LS
4.5.3: Project alternatives would not substantially alter drainage patterns but reservoir expansion would increase the reservoir shoreline area subject to erosion.	LS	LS	LS	LS
4.5.4: Project alternatives would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff during operation.	LSM	LSM	LSM	LSM
4.5.5: Project Alternatives 1, 2, and 3 could place structures within a 100-year flood hazard area as mapped on a federal Flood Insurance Rate Map, which could impede or redirect flood flows.	LS	LS	LS	LS
4.5.6: The project alternatives would not substantially increase the exposure of people and/or structures to risks associated with inundation by dam or levee failure.	LS	LS	LS	LS
4.5.7: Construction and operation of the project alternatives would not make a cumulatively considerable contribution to cumulative effects on drainage, flooding, groundwater recharge or water quality degradation in the project area.	LS	LS	LS	LS

NOTES:

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

4.5.3 Impacts and Mitigation Measures

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, none of the proposed facilities would be constructed. Local hydrology and drainage in the vicinity of proposed project facilities would be expected to remain substantially the same. Therefore, this alternative would not result in potential water quality degradation of surface water or groundwater or expose people to potential hazardous conditions associated with the placement of facilities within 100-year floodplain areas or areas susceptible to flooding from dam or levee failure.

Impact 4.5.1: During construction, the project alternatives could violate water quality standards through increased erosion and sedimentation to local waterways, release of fuels or other hazardous materials during construction, or dewatering of excavated areas that could result in substantial water quality degradation. (Less than Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

Erosion/Sedimentation. The construction of the new dam impoundment would involve substantial excavation, soil stockpiling, grading, and drilling, and limited blasting, as well as installation of a cofferdam. Existing facilities within the expanded reservoir inundation zone would be demolished and removed, and support structures and new access roads would be installed. Removal of any existing vegetation or impervious surfaces would expose underlying soils that were previously not as susceptible to erosion. During these construction activities, areas of bare soil would be exposed to surface runoff generated during storm events. Contact with loose bare soil could entrain sediments into the runoff causing sedimentation of the water which could impact water quality in receiving waters downstream. As discussed below in Mitigation Measures 4.5.1a and 4.5.1b, erosion-control measures that are commonly practiced in construction projects of this size and nature, typically are designed to contain disturbed soil and rock materials during construction and storage according to proven best management practices.

In order to make the modifications to the dam itself, the existing Los Vaqueros Reservoir would be drained over a six-month period by discharging stored water to the CCWD water system using existing facilities. Therefore, the draining of the reservoir would not be accomplished through additional flows to Kellogg Creek which might induce or accelerate streambank erosion within the lower Kellogg Creek stream channel. The CCWD water system is designed to accommodate sedimentation of reservoir water and a majority of groundbreaking activities would occur upstream of the dam which would not impact waters downstream. Therefore any sedimentation that might occur within the reservoir would be treated through existing facility operations.

Accidental Release of Hazardous Materials. Hazardous materials associated with construction equipment and practices, such as fuels, oils, antifreeze, coolants, and other substances, could also adversely affect water quality if released to surface waters. This possibility is also addressed through standard mitigation measures, described below.

Dewatering. Groundwater would be extracted during dewatering operations for the construction of the dam. The quality of groundwater may vary in terms of turbidity, dissolved solids, nutrients, and metals, and the potential exists for extracted groundwater to contain constituents in excess of applicable standards, thereby adversely affecting receiving water quality. However, as discussed in Mitigation Measure 4.5.1b, compliance with RWQCB General Order No. 5-00-175 would protect the water quality of receiving waters.

Delta Intake Facilities

Erosion/Sedimentation. Construction of the new Delta Intake, Pump Station, and related facilities under Alternative 1 would require in-channel construction activities within Old River and also temporarily expose bare soils related to construction of the pump station and levee improvements. For the new intake, excavation of materials within Old River would be required. If construction practices do not include measures to protect soils and waterways from erosion and sedimentation, then sediment-laden runoff could reach surface waters and, in turn, degrade receiving water quality leading to downstream sedimentation. Most of the construction activities for the intake facilities would be conducted in a dewatered cofferdam and would be isolated from Old River by sheet piles to isolate the work area from the water and provide a means to conduct construction work in a dewatered environment. After installation of the cofferdam, the water in the cofferdam enclosure would be treated (as necessary) and discharged back to Old River, and the remaining intake construction work would be conducted in a dewatered environment. Potential sedimentation and turbidity impacts of installation of the cofferdam itself are addressed in Section 5.3, Delta Fisheries and Aquatic Resources.

The pump station would be located on soft compressible soils that require the installation of a deep foundation system. Preloading of soils through the placement of stockpiled soils may also be required for geotechnical purposes. Surface runoff into Old River is generally protected by the existing levees, however additional erosion control measures, as contained within standard best management practices addressed in Mitigation Measure 4.5.1a, would provide further protection of water quality standards.

Accidental Release of Hazardous Materials. In-water construction activities with hydraulic motorized equipment would present the potential for accidental release of hazardous materials such as hydraulic fluid, fuels, and oils to impact water quality. However, with the use of a cofferdam that would isolate the work area and the ability to treat any water discharged back into Old River, the potential effect is much reduced.

Dewatering. Dewatering of the work area for the new intake would be required. As mentioned above, the water within the cofferdam enclosure would be treated as necessary before being discharged into Old River.

Conveyance Facilities

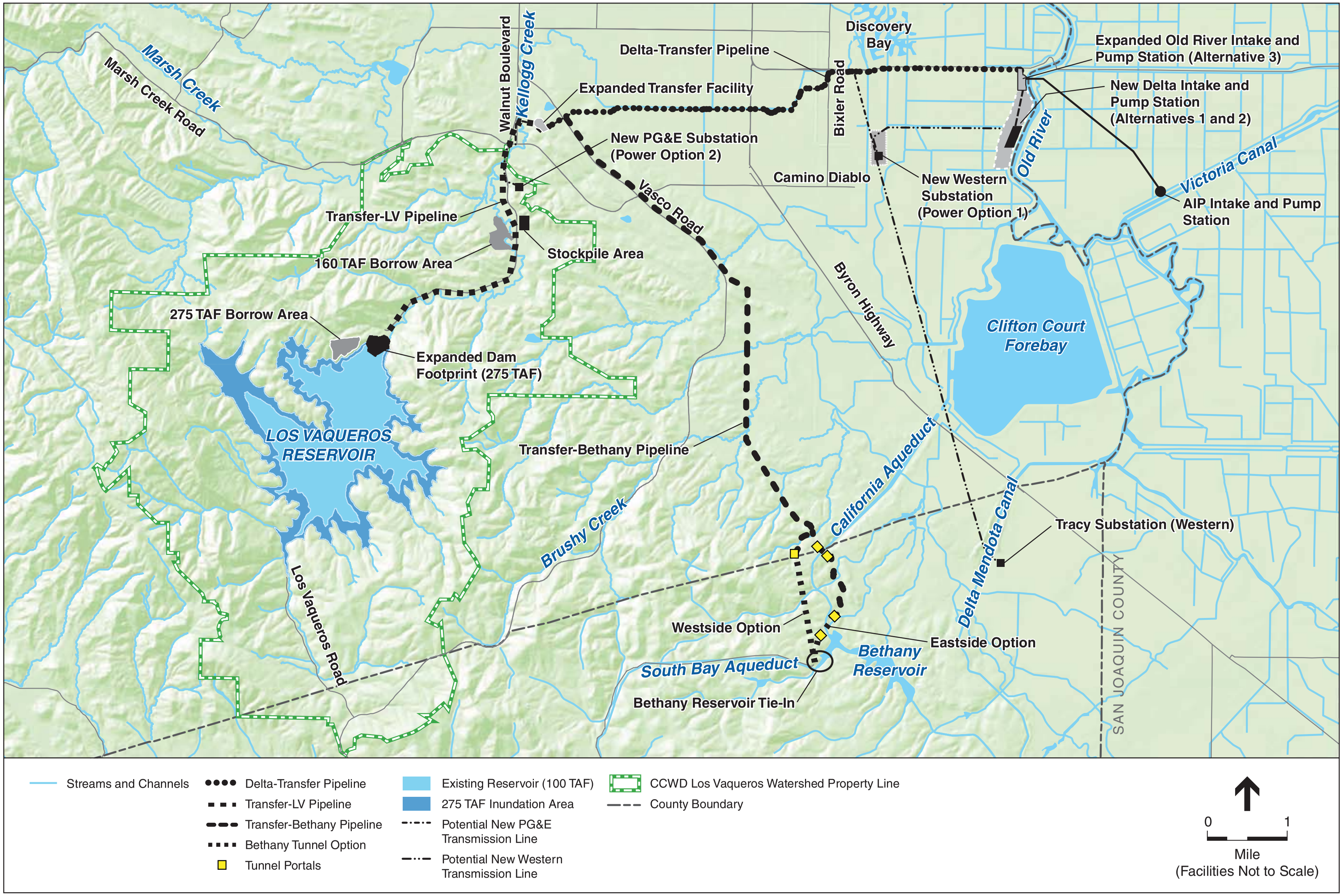
Erosion/Sedimentation. The conveyance facilities under Alternative 1 would require miles of pipeline installation for the Delta-Transfer Pipeline, Transfer-LV Pipeline, the Transfer-Bethany Pipeline, and the Inlet/Outlet Pipelines in addition to the expansion of the Transfer Facility.[2] Construction of the pipelines would primarily use the open-trench method; however, the Transfer-Bethany pipeline would include an approximately 0.8-mile or 1.5-mile tunneled section of pipeline. The Transfer-LV pipeline segment would be constructed along Kellogg Creek, parallel to the creek channel and parallel to other infrastructure in the creek valley. The proposed pipelines would require crossings of Kellogg Creek itself, Brushy Creek, and many other unnamed drainages, as depicted in **Figure 4.5-3**. Trenchless construction methods would be used at major road and railroad crossings, and trenching methods would be employed elsewhere. Disturbing the geomorphic characteristics and stability of the channel bed and banks could lead to chronic erosion problems in the creek's channel. The removal of riparian vegetation along waterways and disturbance of the riverbed and/or bank during trenching activities could also result in increased erosion.

Following construction, potential impacts could be exacerbated if any disturbed or removed riparian vegetation is not reestablished and stabilized prior to the next high-flow or precipitation event or if appropriate stream channel restoration actions are not taken. The potential effects of construction of the Transfer-Bethany Pipeline to the hydrology of vernal pools located in the vicinity of Byron Airport is discussed in Section 4.6, Terrestrial Biological Resources.

Accidental Release of Hazardous Materials. Similar to the discussion above regarding hazardous materials use during construction activities for the Los Vaqueros Reservoir Expansion/Dam Modification, the installation of the conveyance facilities could also adversely affect water quality if accidental upset conditions occurred. However, the RWQCB requirements to prepare and implement a SWPPP with best management practices that include preventative measures would minimize the potential for impacts resulting from upset conditions. In addition, the water pollution control plan required by Sections 401, 402, and 404 of the Clean Water Act would also contain control measures to protect water quality. The tunneling techniques that may be required for major road and railroad crossings could include the use of drilling fluids or bentonite clays or other lubricants. The potential Transfer-Bethany pipeline would include an approximately 0.8-mile or 1.5-mile tunneled section of pipeline. If released accidentally or through fissures in bedrock materials, these drilling materials could also affect water quality if not handled appropriately**.** The best management practices included in Mitigation Measure 4.5.1b, below, contain measures that would reduce the potential for accidental releases of these hazardous materials.

Dewatering. East of the Byron Highway, it is probable that excavation would encounter groundwater, thus requiring dewatering activities. If chemicals (oils, grease, fluids, etc.) are present or sediment is released with the extracted water, discharges could affect surface water

[2] The Blow Off and Air Valves would also be required under this Alternative, however the footprint impacts would be the same for the pipelines so are not discussed separately.



SOURCE: USGS, 1993 (base map); and ESA, 2008

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Figure 4.5-3
Project Area Streams and Drainages

quality. The potential tunneling requirements for the Transfer-Bethany Pipeline might also require some dewatering if groundwater is encountered. See Mitigation Measure 4.5.1b below.

Power Supply Infrastructure

Electrical transmission line construction would have minor ground disturbing impacts and would require little construction equipment. Construction of the substations would disturb up to approximately 2 acres. Potential water quality impacts from construction activities and post-construction runoff would be similar to those described above for erosion/sedimentation and accidental release of hazardous materials. There would be no need for dewatering activities as part of the construction of the Power Supply elements.

Recreation Facilities

Replacement recreational facilities for those lost from reservoir inundation or site modification under Alternative 1 would include a replacement marina and associated marina complex, fishing piers, day-use facilities, parking, and replacement of road segments and hiking trails. There would also be construction of a new interpretive center and, potentially, a new eastside hiking trail. All of these activities would require some ground disturbance and earthwork. Similar to other earthwork activities described above, many of these facilities would require construction practices that incorporate best management practices designed to protect water quality from both erosion and accidental releases of hazardous materials.

Summary

Construction of the proposed improvements under Alternative 1 would include substantial earthwork and grading activities that would disturb large areas of soil. If not managed correctly, these soils could be susceptible to the effects of water induced erosion causing sedimentation of runoff during storm events. In addition, construction of the new Delta Intake and Pump Station would involve in-channel construction within Old River that, even with the cofferdam, would have the potential to create erosion and downstream sedimentation. Hazardous materials associated with construction equipment maintenance and operation and construction practices, such as fuels, oils, antifreeze, coolants, and other substances, would be used at all project sites and could also adversely affect water quality if released to surface waters. Dewatering of groundwater at project sites and discharges to local drainages could also be a source of sedimentation and contamination. The potential impact of project construction activities on water quality is significant. Implementation of the mitigation measures below in combination with the biological mitigation measures (Measures 4.6.2a and 4.6.2b) for all ground disturbing activities under Alternative 1 would minimize the potential for water quality standard violations related to erosion/sedimentation, accidental release of hazardous materials during construction, and dewatering. The impact with mitigation would be less than significant.

Alternative 2

Alternative 2 would include all of the same facilities as in Alternative 1; therefore construction activities under this alternative would also result in significant water quality impacts if not managed correctly. Implementation of the mitigation measures presented below, along with the biological mitigation measures (Measures 4.6.2a and 4.6.2b), would reduce the potential impacts related to violations of water quality standards to less than significant.

Alternative 3

Similar to Alternative 1, construction of the expanded reservoir, pipelines, expanded Transfer Station, electrical transmission facilities, and recreation facilities could result in significant water quality impacts and potential violation of water quality standards due to erosion, sedimentation, release of hazardous materials, and/or dewatering and disposal of groundwater if not managed correctly. Under Alternative 3, the existing Old River Intake and Pump Station would be expanded to 320 cfs instead of constructing the new Delta Intake and Pump Station. Therefore, under this alternative there would be no in-channel construction in Old River. In addition, this alternative would not include construction of the Transfer – Bethany Pipeline, which is expected to extend 8.5 to 8.9 miles long. Without the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline, the total amount of earthwork and grading activities and total extent of construction area and activities would be less than would occur under Alternative 1, but would remain significant. Implementation of the mitigation measures presented below, along with the biological mitigation measures (Measures 4.6.2a and 4.6.2b), would reduce the potential impacts related to violations of water quality standards to less than significant.

Alternative 4

Alternative 4 would include significantly less construction of new facilities than Alternative 1. The reservoir would be expanded to 160 TAF but there would be no expansion of the Transfer Facility or construction of a new Delta Intake Facility, any new pipelines or additional electrical transmission facilities. Reservoir expansion would still require relocation of existing recreation facilities but not to same extent as required under Alternative 1. Reservoir expansion would require the excavation, transport, stockpiling, grading, drilling, blasting, and use of a substantial quantity of bedrock, alluvium, and soil; however the total volume would be less than that required for Alternative 1. Although the total amount of soil disturbance, amount of construction equipment and construction activities would be less under Alternative 4 compared to Alternative 1, the impact would remain significant. Implementation of the mitigation measures presented below, along with the biological mitigation measures (Measures 4.6.2a and 4.6.2b), would reduce the potential impacts related to violations of water quality standards to less than significant.

Mitigation Measures

Measure 4.5.1a: CCWD shall ensure that a Storm Water Pollution Prevention Plan (SWPPP) is prepared in accordance with the requirements of the RWQCB's NPDES General Construction Permit requirements. The SWPPP will be designed to identify and control pollutant sources that could affect the quality of stormwater discharges from the construction sites through the development of best management practices (BMPs). BMPs will include those that effectively target pollutants in stormwater discharges to prevent or minimize the introduction of contaminants into surface waters. To protect receiving water quality, the BMPs will include, but are not limited to, the following:

- Temporary erosion control measures (fiber rolls, staked straw bales, detention basins, check dams, geofabric, sandbag dikes, or temporary revegetation or other ground cover) will be employed for disturbed areas.

- No disturbed surfaces will be left without erosion control measures in place during the winter and spring months.

- Sediment will be retained onsite by a system of sediment basins, traps, or other appropriate measures.

- The construction contractor will prepare standard operating procedures for the handling of hazardous materials on the construction site to prevent discharge of materials to stream or storm drains. This will include the contractor establishing specific fueling areas for construction vehicles and equipment located at least 200 feet from drainages. Grading areas must be clearly marked and equipment and vehicles must remain within graded areas. The contractor will also identify and implement as appropriate specific procedures for handling and containment of hazardous materials, including catch basins and absorbent pads.

- Wherever construction work is performed near a creek, reservoir, or drainage area (excluding work that is permitted for working in the drainage itself), a 100 foot vegetative or engineered buffer will be maintained between the construction zone and surface water body. Specific water bodies to be protected through implementation of this BMP include but are not limited to: Los Vaqueros Reservoir, Kellogg and Brushy Creeks, Bethany Reservoir, the South Bay Aqueduct, and/or other seasonal drainages.

- Native and annual grasses or other vegetative cover will be established on construction sites immediately upon completion of work causing disturbance.

Measure 4.5.1b: If groundwater cannot be contained onsite during construction, the construction contractor(s) will ensure that the water is pumped into multiple Baker tanks or approved equivalent with either a filter or gel coagulant system or other containment to remove sediment. The remaining water will then be discharged to a designated receiving water body or via land application in accordance with the requirements of RWQCB Order No. 5-00-175. On upland areas, sprinkler systems may be used to disperse the water in support of revegetation efforts. BMPs, as described in the SWPPP, will also be implemented to retain, treat, and dispose of groundwater. Measures will include but are not limited to:

- Retaining pumped groundwater in surface facilities to reduce turbidity and suspended sediment concentrations;

- Treating (i.e., flocculating) pumped groundwater to reduce turbidity and concentrations of suspended sediments if turbidity exceeds RWQCB effluent limitations as defined in General Order 5-00-175;

- Directly conveying pumped groundwater to a suitable land disposal area capable of percolating flows;

- If contamination is suspected, water collected during dewatering will be tested for contamination prior to disposal;

- Discharges will comply with the RWQCB's requirements.

Impact Significance after Mitigation: Implementation of the above measures, in combination with biological mitigation measures (Measures 4.6.2a and 4.6.2b), would reduce the potential impact to less than significant levels.

Impact 4.5.2: Construction and operation of the project alternatives would not deplete local groundwater supplies or interfere with groundwater recharge. (Less than Significant)

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

Overall, the reservoir expansion and dam modification would not require long term extraction of groundwater supplies or significantly interfere with groundwater recharge. The only potential extraction of groundwater would occur during temporary dewatering for construction of the dam embankment. Dewatering operations could be required during the initial construction activities of the new dam impoundment. However, any localized drawdown due to dewatering operations would be minimal and temporary.

The temporary draining of the reservoir may result in very localized lowering of the water table in areas immediately adjacent to the reservoir. However, as noted above in the setting section, groundwater recharge from the existing reservoir is limited in any event due to the complexity of underlying bedrock geology. Downstream of the dam, flows from upstream of the reservoir would be bypassed around the dam to allow flow to continue into the lower creek, thereby contributing recharge within the alluvial fan similar to existing conditions. There are no wells located in the immediate vicinity of the reservoir that could be affected during reservoir dewatering.

In the longer term, the expanded reservoir would create a much larger area of potential groundwater recharge than under existing conditions due to newly inundated areas. Although currently groundwater recharge beneath the reservoir is limited, some would occur and this would be increased over existing conditions.

Delta Intake Facilities

Alternative 1 would include construction of the new Delta Intake and Pump Station. Construction of these facilities would require dewatering of the work area within Old River. This water would be discharged back into Old River following any necessary treatment thereby having no net effect on groundwater supply levels. Due to relatively shallow groundwater levels to the east of the Byron Highway, the new Delta Intake and Pump Station could also require temporary dewatering for construction purposes. However, considering the temporary nature of required pumping and the high clay content of these shallow soils, which typically have low permeabilities, the anticipated amount of water requiring extraction would be very low and result in very localized effects. In addition, the extracted water would likely be discharged locally, provided that the water meets the requirements of the RWQCB General Order No. 5-00-175.

Following construction, the new pump station would introduce new impervious surfaces (20 acres or less) that would prevent groundwater recharge immediately beneath the footprint of the facility. However, the stormwater runoff would likely be directed to adjacent open space areas, which would allow for groundwater recharge. Construction of additional impervious surfaces associated with the proposed intake and pump station facility would not result in a substantial reduction in groundwater recharge within the project area.

Conveyance Facilities

The proposed conveyance pipelines would only contribute minor amounts of additional impervious surfaces to the project area through construction of blow off and air valves, which are the only above ground features associated with these pipelines. The pipelines themselves would be constructed below ground surface and covered with earthen materials.

New impervious surfaces would be installed as part of the transfer facility expansion. Because surrounding areas would remain pervious and runoff would likely be directed to the outlying open space areas such as the existing ponds created for use in the event the facility required draining, no noticeable change in groundwater levels would be anticipated.

In areas east of the Byron Highway, groundwater levels are close to the surface. In these areas, dewatering operations would likely be required along all or most of the Delta-Transfer pipeline alignment. It is expected that any localized drawdown of shallow groundwater created by these activities would be temporary with a very limited areal extent due to the high clay content of the shallow soils.

Dewatering could also be required along some portions of the Transfer-Bethany pipeline alignment in the vicinity of streams where groundwater is high or other areas of potentially shallow groundwater. Additionally, dewatering associated with construction of proposed tunnels along the Transfer-Bethany pipeline alignment options could result in temporary and localized drawdown of groundwater. However, as discussed above, given the temporary nature of the dewatering activities in addition to the fact that this water would likely be discharged to nearby drainages in accordance with RWQCB General Order 5-00-175, the effect on groundwater supplies would be minimal.

Power Supply Infrastructure

Construction and operation of the electrical power facilities would include very limited areas of impervious surface associated with portions of the proposed new substation(s) (one under Power Option 1: Western Only, and one under Power Option 2: Western and PG&E), estimated to occupy 2 acres or less, and footings for new transmission lines. Runoff from these small new areas of impervious surface would likely all be directed to surrounding open space areas thereby having little effect on groundwater recharge potential or local supplies.

Recreation Facilities

Recreation facilities, including the relocated marina facility, interpretive center, fishing piers, day use facilities, parking and access roads, as well as relocated and possibly new hiking trails would be replaced under this alternative. There is no dewatering anticipated as part of construction for these elements. The new facilities would replace existing facilities and therefore would not substantially increase the extent of impervious surface now in place within the watershed.

Summary

During construction, temporary dewatering would be required for a number of project facilities included under Alternative 1. For areas east of Byron Highway where groundwater levels are shallow and the soils contain high clay content, the dewatering effects on local groundwater would be very limited in areal extent. Dewatering for the construction of the new Delta Intake and Pump Station would discharge back into Old River. Other dewatering efforts would result in localized and temporary changes in groundwater levels near the active dewatering site. Development of the proposed facilities would result in a small incremental increase in impervious surface in the project area. As is the case at current facilities, runoff from these impervious surface areas would be directed to drainages in adjacent open areas such that there would be a less than significant change to groundwater recharge potential. With the expansion of the dam, the increased inundation areas would contribute limited increased recharge. Therefore, the potential impact to groundwater supplies and groundwater recharge would be less than significant.

Alternative 2

Alternative 2 would include all of the same facilities as in Alternative 1 and therefore, the potential impacts related to groundwater supplies and groundwater recharge for Alternative 2 would be the same as Alternative 1. This impact would be less than significant.

Alternative 3

Alternative 3 would have potential effects on groundwater supplies and groundwater recharge similar to but less than those described for Alternative 1 because this alternative includes most but not all of the same facilities proposed under Alternative 1. Alternative 3 includes the same facilities as Alternative 1 except that under this alternative the existing Old River Intake and Pump Station would be expanded to 320 cfs, and the new Delta Intake and Pump Station and the Transfer-Bethany Pipeline would not be constructed. The expansion of the existing Old River Intake and Pump Station would occur within the existing facility site and involve no ground disturbance, no dewatering and no increase in impervious surfaces. Expansion of this facility would avoid any impact to groundwater recharge or supplies and avoid any of the groundwater effects described for construction of the new Delta Intake and Pump Station. Alternative 3 would have less than significant effects on groundwater supplies and recharge.

Alternative 4

Alternative 4 would involve significantly less construction of new and expanded facilities than Alternative 1. The reservoir would be expanded to 160 TAF and recreation facilities affected by the expansion would be relocated within the watershed. The borrow area for shell materials adjacent to the dam would be smaller under this alternative than that required for Alternatives 1, 2, and 3 and an additional borrow area for the clay core materials would be required in Kellogg Valley. This alternative does not include expansion of the Transfer Facility or construction of the new Delta

Intake Facility, or any new pipelines or electrical transmission lines. The proposed expansion of Los Vaqueros Reservoir to 160 TAF under this alternative as opposed to 275 TAF under Alternative 1 would result in a smaller inundation area. The expanded reservoir inundation area would still increase potential groundwater recharge over existing conditions due to newly inundated areas, but not as much as under Alternative 1. However, recharge beneath the reservoir is currently understood to be limited, so this is only a minor beneficial effect under any alternative. The shift in borrow area location would result in potential increase in ground disturbing activities which could present increased potential for erosion and sedimentation impacts. Overall, there would be less dewatering and less increase in impervious surfaces under Alternative 4 compared to Alternative 1. Impacts to groundwater supplies and recharge would be less than significant.

Mitigation: None required.

Impact 4.5.3: Project alternatives would not substantially alter drainage patterns but reservoir expansion would increase the reservoir shoreline area subject to erosion. (Less than Significant)

Alternative 1

All Facilities

Construction of the proposed facilities under Alternative 1 would not alter existing drainage patterns. Drainages surrounding the Los Vaqueros Reservoir would continue to drain in to the reservoir after expansion. The existing dam would be raised and modified essentially in place, and therefore would not alter existing drainage patterns above or below the dam. Construction of the new Delta Intake and Pump Station would occur on and adjacent to the levee along Old River and would not alter the drainage patterns across the neighboring agricultural lands. The Transfer Facility expansion would occur adjacent to the existing Transfer Facility on CCWD property that has been graded but not previously developed. The expansion area is not located within an existing drainage and site development would not alter the local drainage patterns.

The proposed pipelines would be buried subsurface with surface contours restored such that existing drainage patterns would not be substantially altered. The issue of pipeline installation on agricultural land and potential effects of trench backfilling and compaction that could change site-specific drainage patterns on the agricultural land immediately adjacent to the pipeline corridor is discussed in Section 4.8 Agriculture. This is an issue specific to certain types of agricultural soils (such as the peat soils in the Delta) and represents a potential impact on agricultural activities rather than substantial alteration of drainage in the project area.

Power Supply facilities, including construction of a new substation, addition of a 21 kV powerline (Option 1 – Western Only) and/or upgrading of existing transmission lines, would not alter drainage patterns. This is due to the size of substation siting zones that would allow flexibility in facilities siting to avoid adversely modifying drainage patterns. Streams could be spanned by power lines and otherwise designed to accommodate local drainage crossings.

Recreation facilities to be relocated and expanded within the Los Vaqueros Watershed are not located in drainage areas and would not interfere with or substantially alter drainage patterns within the watershed. As is the case with the existing trails in the watershed, new and relocated trails would be designed to accommodate local drainage crossings.

Los Vaqueros Reservoir Expansion/Dam Modification

Upon completion of the expanded reservoir, the increased reservoir water level would result in a larger shoreline area. The existing conditions consist of approximately 14 miles of shoreline, which under the expansion in Alternative 1 would increase to approximately 24.7 miles. Under existing conditions, an approximate 4.5-mile eroded portion of the 14-mile shoreline produces sediment that has resettled 5 to 12 feet below the high-water elevation (CH2M Hill, 2002).

The new shoreline areas would be subject to erosion by wave action and seasonal fluctuation in water levels. These fluctuations in reservoir water level could temporarily and periodically expose a band of up to 100 feet of bare soil around the reservoir to erosion. Increased erosion could increase total suspended sediments within the reservoir. As is currently the case, sedimentation is not a key issue for this reservoir. Unlike an on-stream reservoir that continually receives sediment input from upstream, as an off-stream reservoir, Los Vaqueros receives little sediment annually. While the expanded shoreline would be exposed to erosion forces that could contribute additional sediment into the reservoir, the sediment would simply remain in the reservoir. This potential incremental contribution of sediment to the reservoir is not expected to appreciably affect reservoir water quality. In addition, the reservoir outlet facilities allow CCWD to withdraw water from different levels within the reservoir such that any short-term increase in reservoir turbidity would not affect the District's ability to withdraw high quality water from the reservoir for treatment and distribution to its customers. The potential for shoreline erosion and related effects on the reservoir capacity or the reservoir water quality is less than significant.

Alternative 2

Alternative 2 would include all the same facilities as proposed under Alternative 1. As described for Alternative 1, development of these facilities would not substantially alter drainage patterns in the project area. Alternative 2 would include the same reservoir expansion proposed under Alternative 1. Therefore the potential impacts related to shoreline erosion would be exactly the same as those described for Alternative 1, which would be less than significant.

Alternative 3

Alternative 3 would include most but not all of the facilities proposed under Alternative 1. It would not include the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. It would include instead expansion of the Old River Intake and Pump Station, but this would occur on the existing facility site and would not involve any ground disturbing activities or site modification. As described for Alternative 1, development of the project facilities would not substantially alter drainage patterns in the project area. Alternative 3 would include the same reservoir expansion proposed under Alternative 1. Therefore the potential impacts related to shoreline erosion would be exactly the same as those described for Alternative 1, which would be less than significant.

Alternative 4

As described under Alternative 1, reservoir expansion and the associated dam modification, as well as the clay core borrow area or relocation and expansion of recreation facilities within the watershed, would not substantially alter drainage patterns. The specific location and layout of the borrow area for this alternative has yet to be determined but restoration efforts following the excavation of borrow materials would include measures to restore the general drainage patterns. Alternative 4 would expand Los Vaqueros Reservoir to 160 TAF, which would result in a smaller inundation area than the 275 TAF expansion under Alternative 1. The shoreline area around the expanded reservoir would increase from 14 to 18.9 miles. This would be a smaller area of potential shoreline erosion impact than associated with the 275 TAF reservoir expansion proposed under Alternative 1 and the impact would be less than significant.

Mitigation: None required.

Impact 4.5.4: Project alternatives would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff during operation. (Less than Significant with Mitigation)

The proposed project facilities are all located in the rural, agricultural areas of southeastern Contra Costa and northeastern Alameda County that are not serviced by storm drainage infrastructure. The proposed pipelines would be buried underground and would not produce additional site drainage or runoff. Under all alternatives, the proposed project would not make use of or require development of stormwater drainage infrastructure. The use of the reservoir, natural drainage swales, and existing drainage ponds for discharge of runoff from the few areas containing impervious surfaces would be more than sufficient to handle anticipated stormwater runoff. Therefore, the proposed project under all alternatives would not impact the capacity of existing or planned infrastructure. However, the following analysis discusses the potential for substantial additional sources of polluted runoff to impact receiving waters during the operational phase of the project.

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

The expansion of Los Vaqueros Reservoir alone would result in a rise of the reservoir water level but would not create any new impervious surfaces or additional sources of polluted runoff (the effects of potential additional sedimentation from erosion effects are discussed above in Impact 4.5.3). The raising of the dam crest would continue to direct runoff either towards the reservoir or Kellogg Creek as is the case in existing conditions. The larger footprint of the dam would result in a minor change in existing drainage patterns but ultimately the flows from the downstream side of the dam would continue to flow into Kellogg Creek as before. The related appurtenances such as the spillway, the inlet/outlet works, and the reservoir oxygenation system would, in general, be constructed similarly to the existing systems and would not represent a significant change to runoff. Therefore, the expansion of the reservoir and modification of the dam and related appurtenances would not create any additional sources of polluted runoff.

New Delta Intake and Pump Station

The new Delta Intake and Pump Station facilities would be constructed under this alternative. These facilities would create additional impervious surfaces which could result in additional sources of polluted runoff from any oils or fuels used in the operational maintenance of this facility. Runoff at the new facility would be handled similar to how the Old River intake facility is constructed where runoff is collected, treated and pumped back into Old River. With incorporation of Mitigation Measure 4.5-2 below, the runoff would be treated to the maximum extent practical which would minimize the potential for water quality in Old River to be impacted.

Conveyance Facilities

The only impervious surfaces introduced as part of the conveyance facilities would be associated with the Transfer Facility Expansion and the blow off and air valves. Currently the Transfer Facility directs runoff to ponds that were built to take discharge in the event that the transfer needed to be drained. The expanded Transfer Facility would similarly direct runoff to these ponds. The pipelines themselves would be constructed below ground surface and covered with earthen materials, however the blow off and air valves would be completed above ground but would not represent any significant runoff nor represent a source of polluted runoff. Therefore, the only potential change to stormwater quality would be associated with the expanded Transfer Facility which would be designed in accordance with the stormwater controls contained in Mitigation Measure 4.5-2 which are designed to minimize the potential for polluted runoff to exit the site.

Power Supply Infrastructure

As mentioned above, the electrical power facilities would include very limited areas of impervious surfaces associated with portions of the proposed new substation(s) (one under Power Option 1: Western Only, and two under Power Option 2: Western and PG&E), that would occupy 2 acres or less, and footings for new transmission lines. Stormwater from these facilities would be directed toward the nearest drainage swale and treated to the maximum extent practical as required by Mitigation Measure 4.5-2 below. The transmission lines would result in a negligible increase of impervious surfaces and would not be considered as an additional source of polluted surface runoff.

Recreation Facilities

Recreation facilities, including the relocated marina facility, interpretive center, fishing piers, day use facilities, parking and access roads, as well as relocated and possibly new hiking trails would result in construction of a relatively small area of additional impervious surfaces. However, these facilities would be replacement of existing facilities and would not result in a significant change of runoff or the source of runoff. Stormwater runoff would continue to be routed toward the reservoir and parking areas and would receive similar if not improved treatment, as required by Mitigation Measure 4.5-2, prior to discharge through retention basins and oil/water separators. Use of oil/water separators and other treatment control measures such as bioswales and vegetative infiltration would reduce the potential for polluted stormwater runoff.

Summary

Alternative 1 would include the construction or expansion of facilities that would introduce new impervious surfaces. Some of these facilities would merely be replacement facilities, such as the recreation facilities, that would include the same or improved stormwater management controls. With no existing stormwater infrastructure, all stormwater runoff would be ultimately discharged to the nearest drainage or existing retention ponds with treatment controls where appropriate. Therefore, with incorporation of similar stormwater quality control measures, as required by the Mitigation Measure 4.5-2 below, that are similar or improved over existing conditions, Alternative 1 would not create significant sources of polluted runoff.

Alternative 2

Alternative 2 would include all of the same facilities as in Alternative 1, therefore, the potential impacts related to polluted runoff for Alternative 2 would be the same as described in Alternative 1 and would be less than significant with incorporation of Mitigation Measure 4.5-2.

Alternative 3

Alternative 3 would include most but not all of the facilities proposed under Alternative 1. It would not include the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. It would include expansion of the Old River Intake and Pump Station but this would occur on the existing facility site and would not involve any new impervious surfaces or additional sources of polluted runoff. As a result, the impacts on stormwater quality under Alternative 3 would be similar to those described above for Alternative 1 except that this alternative would avoid any potential impacts to water quality in Old River associated with runoff on the new Delta Intake and Pump Station. Impacts would be less than significant after implementation of Mitigation Measure 4.5-2.

Alternative 4

Alternative 4 would involve significantly less construction of new and expanded facilities than Alternative 1. The reservoir would be expanded to 160 TAF and recreation facilities affected by the expansion would be relocated within the watershed. This alternative does not include expansion of the Transfer Facility or construction of the new Delta Intake Facility, or any new pipelines or electrical transmission lines. The proposed expansion of Los Vaqueros Reservoir to 160 TAF under this alternative as opposed to 275 TAF under Alternative 1 would result in a smaller inundation area. Overall, Alternative 4 would have a reduced potential for polluted runoff compared with Alternative 1. However, with implementation of the stormwater controls, contained in Mitigation Measure 4.5-2, for the relocated recreation facilities, Alternative 4 would have a less than significant impact on polluted runoff.

Mitigation Measures

Measure 4.5.2: CCWD shall design facilities with introduced impervious surfaces with stormwater control measures that are consistent with the Regional Water Quality Control Board's NPDES municipal stormwater runoff requirements. The stormwater control measures shall be designed and implemented to reduce the discharge of stormwater pollutants to the maximum extent practical. Stormwater controls such as bioretention facilities, flow-through planters, detention basins, vegetative swales, covering pollutant sources, oil/water separators, retention ponds, shall be designed to control stormwater quality to the maximum extent practical. In addition, CCWD shall prepare and implement a Stormwater Facility Operation and Management Plan that assigns responsibility for maintenance of stormwater facilities for the life of the project.

Impact Significance after Mitigation: Less than Significant.

Impact 4.5.5: Project Alternatives 1, 2, and 3 could place structures within a 100-year flood hazard area as mapped on a federal Flood Insurance Rate Map, which could impede or redirect flood flows. (Less than Significant)

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

As under existing operating conditions, the expanded reservoir would continue to provide flood control within the Kellogg Creek watershed. The existing reservoir currently acts to decrease the magnitude of the 100-year peak flow event in Kellogg Creek below the dam by having the capacity to contain flood flows and controlling the release of water downstream. Generally, the reservoir fills to its highest operating levels by spring to early summer and then the levels are drawn down for water supply use. By the time of the rainy season, when a 100-year flood is generally anticipated, the reservoir has more than enough capacity to handle large storm events. Even at full operating capacity, the reservoir has been designed to have sufficient freeboard to attenuate flood flows to approximately 150 cfs in lower Kellogg Creek (CH2M Hill, 2002). In 1998, 400-cfs wet-year flows were measured in Kellogg Creek downstream of the reservoir. The reservoir held back an additional 400 cfs, thereby protecting the community of Byron and other downstream areas from flooding. Below Camino Diablo Road, the existing reservoir has less effect on the 100-year peak flow event, since up to approximately 1,500 cfs of flow is produced by runoff that originates below the reservoir (CCWD and Reclamation, 1993). When additional releases are added from the dam, local runoff below the dam results in an estimated 100-year peak flow of 1,560 cfs at Camino Diablo Road (CCWD and Reclamation, 1993).

Under the project, these peak-flow conditions would be relatively unchanged. Localized flooding could still occur along the five-mile stretch between the mouth of Kellogg Creek and the State Route 4 bridge, since the channel capacity along this portion of the reach is only 200 to 1,100 cfs, and 100-year peak flow runoff is estimated to reach up to 1,560 cfs (CCWD and Reclamation, 1993). By design, the proposed project would carry forward the flood control benefits of the existing reservoir to safely pass the maximum flood without overtopping. For this reason, the reservoir expansion would not increase risks to people or structures within the 100-year flood hazard area, as mapped on a federal Flood Insurance Rate Map, or significantly impede or redirect existing flood flows.

Portions of the inlet/outlet pipelines would be constructed parallel to Kellogg Creek near the base of the existing dam and would require channel crossings at three locations. These new pipelines would be located within the 100-year flood zone, but once constructed they would be buried below ground improvements that would not be subject to damage due to flooding. Construction activities for these pipelines would be of limited duration, would be performed during the dry season, and would occur below the existing dam impoundment; therefore, it is unlikely that construction workers would be exposed to any flood risk. Once installed, surface contours would be restored above these pipelines and they would not significantly impede or redirect flood flows or increase flooding hazards in other areas.

Delta Intake Facilities

The new Delta Intake and Pump Station would be located in the 500-year flood zone as defined by FEMA. The area is protected from the 100-year flood hazards by the existing levee along Old River. The proposed project includes improvements to the levee in the area of the new Delta Intake and Pump Station which would enhance the flood protection for this facility. An earthen setback levee (or ring levee around the site) would be installed for protection during construction and would remain a permanent structure to provide secondary containment of Old River in the event of a flood in the area. This facility would be protected from flood flows but would not impede or redirect flood flows.

Conveyance Facilities

Most of the proposed pipeline alignments are located outside of the 100-year floodplain. Following construction, the pipelines would generally be buried 7 to 10 feet below the ground surface. The only above ground features associated with the conveyance facilities would be the Blow Off and Air Valves, each of which occupies only a small area of land. These above ground structures would be designed in light of the potential flood risk and would not impede flood flows.

Work around the levee for the Old River Intake, CCWD would use standard geotechnical engineering practices related to the stabilization and compaction of soils during and after construction of the pipeline to ensure that the integrity of the levee is not compromised. Such practices include soil densification of foundation soils to improve their stabilization and reduce potential liquefaction. Further discussion of seismic stability of the proposed project is provided in Section 4.4 Geology, Soils, and Seismicity. Construction plans, specifications, and inspections would be coordinated with the Reclamation Board, where appropriate. Therefore, these pipelines are not expected to significantly impede or redirect flood flows.

Power Supply Infrastructure

The majority of the transmission poles and potential substations would not be located in a FEMA-defined 100-year flood zone and would not affect 100-year flood flows. The proposed Western substation is located in the 500-year flood zone and some of the poles would be located in the 100-year flood zone as the new line is extended from Western's Tracy substation to the new substation as shown in Figure 4.5-2. However, power poles are not at risk for flood damage nor would they impede or redirect any flood flows. The proposed PG&E substation under Power Option 2 would be located outside the 100-year and 500-year flood zones.

Recreation Facilities

Recreation facilities, including the relocated marina facility, interpretive center, fishing piers, day use facilities, parking and access roads, as well as relocated and possibly new hiking trails would be located outside of the 100-year and 500-year flood zones. Therefore, these facilities would not significantly impede or redirect flood flows.

Summary

The expansion of the reservoir and modification of the dam crest height would be designed to maintain the existing flood control capacity of the reservoir for flows in lower Kellogg Creek. All of the conveyance facilities, with the exception of the Blow Off and Air Valves, would be completed subsurface and would not be affected by flood flows nor affect flood flows. The new Delta Intake and Pump Station would be located within the 500-year flood zone and protected by an engineered setback levee as well as the existing levee along Old River. Other proposed project facilities would be located either outside of a flood zone or do not represent improvements that affect or could be affected by flood flows. The potential impact from structures being placed within the 100-year flood zone would be less than significant.

Alternative 2

Alternative 2 would include all of the same facilities as in Alternative 1; therefore, the potential impacts related to flood flows for Alternative 2 would be the same as described in Alternative 1 and would be less than significant.

Alternative 3

Alternative 3 would include most but not all of the facilities proposed under Alternative 1. It would not include the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. It would include expansion of the Old River Intake and Pump Station but this would occur on the existing facility site and would not involve any ground disturbing activities or site modification. As a result, the impacts on flood potential or from flooding under Alternative 3 would be similar to those described above for Alternative 1 except that this alternative would avoid any flood risk associated with work on the Old River levee required for the new Delta Intake and Pump Station. Impacts would be less than significant.

Alternative 4

Alternative 4 would involve significantly less construction of new and expanded facilities than Alternative 1. The reservoir would be expanded to 160 TAF and recreation facilities affected by the expansion would be relocated within the watershed. This alternative does not include expansion of the Transfer Facility or construction of the new Delta Intake Facility, or any new pipelines or electrical transmission lines. The proposed expansion of Los Vaqueros Reservoir to 160 TAF under this alternative would result in a smaller inundation area than the expansion to 275 TAF under Alternative 1. However, the proposed dam crest height, similar to that described for Alternative 1, would continue to have the freeboard capacity to provide flood protection for Kellogg Creek. No structures would be placed in a flood zone under this alternative and the facilities constructed under this alternative would not impede flood flows. Rather, reservoir expansion would provide an increment of additional flood control protection of areas downstream along Kellogg Creek. Effects on flood potential would be less than significant.

Mitigation: None required.

Impact 4.5.6: The project alternatives would not substantially increase the exposure of people and/or structures to risks associated with inundation by dam or levee failure. (Less than Significant)

Alternative 1

Los Vaqueros Reservoir Expansion/Dam Modification

As discussed in Section 4.4 – Geology, Soils and Seismicity (Impact 4.4.1), modern dam impoundments are designed and constructed under conservative guidelines and criteria designed to prevent failure. With modern design criteria and construction practices, combined with DSOD review, the probability of dam failure is extremely small.

The existing facility is a well-compacted zoned-earthfill embankment dam that has been performing very well since the reservoir was first filled 10 years ago. The dam is monitored continuously and inspected routinely and no significant issues have developed with internal pressures, seepage, or deformation in either the embankment or its foundation, and the dam continues to perform well within the parameters set during the design. The probability of failure of the existing Los Vaqueros dam is extremely small. The 10-year history of incident free performance, combined with the detailed knowledge of site conditions obtained from the original construction of the dam embankment, provide dam engineers with extremely valuable information for design of the expansion.

The proposed dam raise for the Los Vaqueros Reservoir expansion would be conservatively designed and engineered following practices that have been developed and proven over many decades, and have evolved from practical experience at dams where tolerable performance limits have been exceeded. The design would incorporate multiple lines of defense or design redundancy. These dam safety design and construction measures are reviewed in Section 4.4 – Geology, Soils and Seismicity (Impact 4.4.1) and include founding the dam on the underlying bedrock, removing any unstable geologic material from the dam site (although this was accomplished previously during construction of the existing dam such that little to no additional material removal is expected to be required), and designing the facility to withstand earthquake and related seismic hazards and flood hazards. As required by DSOD, the dam would be designed to withstand the largest and strongest earthquake (Maximum Credible Earthquake), as well as the largest possible flood (Probable Maximum Flood). The materials and internal zoning of the dam would produce a structure that is very tolerant to seismic deformation and would safely resist the Maximum Credible Earthquake. The proposed reservoir structure would be designed to safely convey the Probable Maximum Flood without overtopping the dam.

As is the case for the existing Los Vaqueros Dam, the performance and safety of the expanded dam would be continuously monitored and recorded by an extensive array of instruments that measure internal water pressures within and seepage from the dam and foundation, settlement of the dam, and earthquake-induced accelerations and deformations. The monitoring instruments include foundation and embankment piezometers, internal and surface settlement and movement sensors, a seepage measurement weir and a series of strong motion accelerographs. Many of these instruments are read in real time by a data acquisition system that would automatically send a signal to CCWD's operations center if a preset threshold limit is exceeded. The dam would be visually inspected on a regular basis by CCWD staff, and an annual surveillance and monitoring report would be prepared and submitted to DSOD.

Although the probability of dam failure is extremely remote, the California Office of Emergency Services requires the preparation of an inundation map and the development of a downstream evacuation plan for areas within the potential inundation area (California Water Code Section 6002, and California Government Code Section 8589.5). Contra Costa County has prepared a current emergency evacuation plan that reflects the inundation scenario associated with the existing facility. As part of the reservoir expansion project, this inundation map would be updated and submitted as part of the design process. Due to the largely flat topography of the areas downstream of the reservoir outside the Los Vaqueros Reservoir, extending east to Old River, the area of potential inundation in a catastrophic release of the expanded reservoir would result in deeper flooding that would require more time to drain/recede compared to the existing dam. However, the reservoir expansion project does not increase the risk of potential dam failure and this risk remains very remote. Most of the historical dam failures at other poorly designed dams have occurred after the dam was overtopped during a large flood. Overtopping erodes the outer face of an earthen dam.

DSOD requires that reservoirs such as Los Vaqueros Reservoir have facilities capable of allowing rapid emergency drawdown of the water in reservoir in the event of an unsafe condition at the dam. DSOD guidelines for emergency drawdown (or "evacuation") of a large reservoir require that the dam facilities have the capability to lower the reservoir level by an amount equal to 10 percent of the hydraulic head[3] behind the dam in ten days, and to evacuate the entire reservoir in 120 days. The existing Los Vaqueros Reservoir accomplishes this via the outlet tunnel and a cone-valve in the outlet structure that can discharge emergency release flows directly into Kellogg Creek. The maximum discharge rate is currently 1,140 cfs, which exceeds the 10-day average rate of 910 cfs needed to meet the first of DSOD's two guidelines.

3 The hydraulic head is the difference between the normal maximum water surface elevation and the deadpool (e.g. the water level below which water can no longer be discharged) elevation.

For the expanded 275 TAF reservoir, the 10-day average discharge rate required to meet the DSOD emergency reservoir drawdown requirements would increase to 2,430 cfs. For the expanded reservoir the emergency discharges would be made through both the existing outlet tunnel and cone-valve, and new inlet conduit. With the cone-valve fully open, the maximum discharge rate to Kellogg Creek increases to 1,500 cfs under the additional 88-feet of reservoir head. The remaining discharge requirement of 930 cfs would be met by back feeding flow through the new inlet conduit to both the Transfer-LV and Delta-Transfer Pipelines for discharge into the CCWD system and Old River. As is the case for the current reservoir, under this emergency reservoir drawdown scenario, shallow flooding would occur along sections of Kellogg Creek during the emergency release. With reservoir expansion, potential flooding would affect a broader area in the eastern county region and the depth and duration of flooding would also increase. However, the risk of an event requiring such an emergency release remains very small, similar to the existing dam. Because the probability of the event occurring is so remote, Alternative 1 would not result in a substantially greater impact due to flooding from emergency reservoir releases.

Dam failure potential due to damage from terrorist activities at the project site is considered relatively low. CCWD has its own internal security measures that are designed to monitor public activity within the watershed and prevent public access to its facilities and resources. In addition, due to the relatively low population density of the area and lack of other prominent political or military targets in the area, the Los Vaqueros Dam would be considered a relatively low profile facility for terrorist interests. Finally, the same control measures that protect the dam from seismic or other failure would also serve to protect against terrorist induced failure.

Delta Intake Facilities

Construction of the new Delta Intake and Pump Station would require modifying the existing levee along Old River, which protects Byron Tract from flooding. Construction work along the existing levee has the potential to destabilize adjacent levee segments and, under worst-case conditions, result in their failure. However, proposed modifications to the levee include reinforcing and substantially widening the levee in the area of the intake to serve as the engineered soil platform for the proposed intake and pump station facilities and to allow for installation of the new intake structure. A new setback levee would be constructed to protect the facility during construction and would remain once complete. Sheet piles would be installed upstream and downstream of the intake location to serve as a seepage barrier, and slope protection (i.e., riprap) would be installed on the water side of the levee for several hundred feet on each side of the intake structure to enhance levee stability.

Construction activities for the new intake along the water side of the existing levee would not be initiated until after completion of the setback levee on the landward side of the existing levee. All new construction for the setback levee would incorporate modern techniques for soil compaction and would be adapted to the local conditions as identified in the project geotechnical investigations. CCWD would be required to design and construct levee modifications with input and approval of RD 800. Inspections would be conducted throughout the construction period in accordance with RD 800 requirements to ensure that site-specific construction conditions meet the requirements. Because the levee modification would modernize and strengthen the segment of levee in the vicinity of the new intake, the project effect on long-term flooding potential for Byron Tract would be somewhat beneficial.

Conveyance Facilities

Construction of the proposed Delta-Transfer Pipeline, Transfer-LV Pipeline and the Transfer-Bethany Pipeline would not affect the dam or any levees in the project area. Therefore, construction of these facilities would not alter the risk of inundation from dam or levee failure. Further, these buried pipelines would not establish any permanent facilities for CCWD personnel that could increase the exposure of people to the risks of inundation from either dam or levee failure. Similarly, the Transfer Facility Expansion would have no effect on the potential risk of inundation from dam or levee failure and would not increase the exposure of people to such risks.

Power Supply Infrastructure

There are no flood risks associated with construction or operation of the power facilities. Levee crossings by power lines would be accomplished by placing towers on either side of the leveed area, at a distance sufficient to preclude any disturbance the existing levees. Electrical power facilities would not be built on top of levees. Levee function and integrity would thereby remain undisturbed. No impact would occur.

Recreation Facilities

Recreation facilities, including the relocated marina facility, interpretive center, fishing piers, day use facilities, parking and access roads, as well as relocated and possibly new hiking trails, would be above the dam, and therefore not affected by any failure of the dam or levees.

Summary

As discussed in Section 4.4 Geology, Soils, and Seismicity, the proposed dam modifications under Alternative 1 will be designed to very conservative standards that would result in a dam considered to have an extremely low potential for failure. Due to the relatively flat topography of the area downstream of the dam, the potential area of inundation would not be significantly different than under existing conditions. The construction of the conveyance and electrical transmission facilities would not affect the dam or levees and thus would not change the risk of inundation from dam or levee failure. Therefore, the potential impact from inundation by dam or levee failure would be less than significant.

Alternative 2

Alternative 2 would include all of the same facilities as in Alternative 1. Therefore, the potential impacts related to dam or levee failure for Alternative 2 would be the same as Alternative 1 and would be less than significant.

Alternative 3

Under Alternative 3 the reservoir would be expanded to 275 TAF as it would under Alternative 1. Therefore, Alternative 3 would involve the same potential risks of inundation from dam failure or emergency release as described for Alternative 1. Under this alternative the Old River Intake and Pump Station would be expanded instead of constructing the new Delta Intake and Pump Station. The expansion of the existing Old River Intake and Pump Station and related facilities would occur inside the existing site, and would not involve any ground disturbing activities or levee modification. Activities at this site would not affect levee stability or increase the risk of levee failure. This alternative would avoid the potential effects on levee stability associated with construction of the new Delta Intake and Pump Station described under Alternative 1. As discussed for Alternative 1, construction of the proposed pipelines, electrical transmission facilities and expanded Transfer Facility would not increase the risk of or expose more people to inundation due to dam or levee failure. The impact would be less than significant.

Alternative 4

Although the reservoir expansion under this alternative would be less than that proposed under Alternative 1, the risk of dam failure would be the same. The potential downstream inundation impacts would be similar, although given the smaller volume of stored water, they would be less for Alternative 4. The 10-day average rate of discharge to meet the State guidelines for emergency reservoir drawdown for the 160 TAF reservoir would be 1,430 cfs. To achieve the required drawdown, the outlet tunnel and cone valve would be used in the same way as the existing Los Vaqueros Dam, except that the maximum discharge rate to Kellogg Creek would increase to 1,340 cfs with the additional 36 feet of head. A larger cone-valve than the existing one could be required to comply with the guidelines.

No other facilities would be constructed under Alternative 4. The impact would be less than significant.

Mitigation: None required.

Impact 4.5.7: Construction and operation of the project alternatives would not make a cumulatively considerable contribution to cumulative effects on drainage, flooding, groundwater recharge, or water quality degradation in the project area. (Less than Significant)

As discussed in Impact 4.5.3, under all alternatives the project would have a less than significant effect on drainage. Proposed facility sites, such as the relocation sites for recreation facilities in the water, the new Delta Intake and Pump Station and the new electrical proposed under either Power Option 1 or Power Option 2 would be small enough that site development would not alter local drainage patterns or increase impervious surface area such that this would alter local storm runoff patterns. In addition, these facilities are spread out over a wide geographic area that is still surrounded by large tracts of open space and pervious surfaces. As discussed above, the project facilities are located within six different planning watersheds. Other development projects are proposed in the project region (i.e. the proposed 1,100-acre Cecchini Ranch and 4,784-acre Mountain House developments) that might affect drainage patterns or more appreciably increase the amount of impervious surface. However, these proposed developments would be required to include storm drainage design measures and improvements to adequately address water quality and quantity changes per local and RWQCB regulations such as C.3 requirements. Given the relatively small size of impervious surfaces created by the proposed project facility sites, their locations within different watersheds and the fact that no other projects are proposed adjacent to project facilities, the Los Vaqueros Reservoir Expansion Project would not make a cumulatively considerable contribution to drainage impacts. The project under all alternatives would also not generate substantial additional stormwater runoff, causing the capacity of the local natural drainage channels to be exceeded; many of the proposed new impervious surfaces are located within the reservoir drainage area and others are located throughout the six different planning watersheds; and there are no improved drainage facilities in the project area that would serve proposed project facilities. The project would not make a cumulative considerable contribution to effects on local drainage facilities.

With respect to flood risk associated with dam failure, no other projects would affect the Los Vaqueros Dam or create new dam facilities in the region, and there would be no cumulative effect in this area. With respect to local levees, the proposed development of the Cecchini Ranch property within the town of Discovery Bay adjacent to Old River might require levee modification (no specific plans are available for evaluation), as would construction of the new Delta Intake and Pump Station under Alternatives 1 and 2. As described in Impact 4.5.5, the first step in construction of the new Delta Intake and Pump Station would be installation of a new setback levee that would strengthen and improve the levee along Old River in this reach. This step would reduce the potential for levee instability or failure during the remainder of project construction and throughout the life of the facility such that the project would not contribute to a cumulative increase in the risk of levee failure along Old River. Rather, the reinforcement of the levee proposed as part of the intake construction process would improve levee stability in the immediate area.

As discussed in Impact 4.5.2, the project's effects on groundwater supply during construction dewatering would be localized. None of the other proposed projects listed in Table 4.1-2 are in the immediate vicinity of the Los Vaqueros Reservoir Expansion Project facilities (with perhaps the exception of the Discovery Bay / Byron Wastewater Treatment Plant Upgrade) where dewatering would occur (i.e., Los Vaqueros Reservoir, new Delta Intake and Pump Station, Transfer-Bethany Pipeline Eastside or Westside Option) such that dewatering effects would combine to cause a cumulative impact. As discussed above, the low permeabilities of most of the soils in the lowland areas limits the areal extent of effects from short term groundwater extraction.

There is a potential for cumulative water quality effects during construction due to earthwork increasing erosion and sedimentation and potential release of hazardous materials used in the construction process (e.g., fuel, paint) if other projects proposed in east Contra Costa County are under construction at the same time as the Los Vaqueros Reservoir Expansion Project. Some of the potential development, roadway, public infrastructure, and trail projects listed on Table 4.1-2 might be in construction at the same time as the project. However, like the Los Vaqueros Reservoir Expansion Project, most of these projects will be required to implement site-specific erosion control and water quality control measures as required by state law. These water quality regulations are intended to effectively reduce water quality impacts from each construction site such that significant cumulative effects do not arise. In addition, as previously mentioned the proposed project facilities are located across six different planning watersheds and therefore the potential effects are more site specific. With implementation of proposed mitigation measures to implement appropriate erosion and water quality control during construction (Mitigation Measures 4.5.1a and b, as well as biological mitigation measures 4.6.2a and 4.6.2b), the Los Vaqueros Reservoir Expansion Project would not make a cumulatively considerable contribution to cumulative water quality effects.

Mitigation: None required.

4.6 Biological Resources

4.6.1 Affected Environment

This section describes the biological resources occurring in the Los Vaqueros Reservoir Expansion Project study area, and assesses the potential for the project alternatives to affect sensitive biological resources. Specific study areas were established for each of the proposed facilities or facility types, and wetlands and other biological resources were cataloged within these areas to provide information needed to assess both the direct (footprint) and indirect effects (such as construction noise, light, or erosion) of the project on biological resources. Study areas include:

- **Expanded Reservoir:** This study area includes the maximum inundation area plus an approximately 1,000-foot wide buffer around the expanded reservoir.
- **Facilities within the Los Vaqueros Watershed:** The study area for proposed facilities within the watershed (referred to in this section as other in-watershed facilities), which include the recreational facilities, the borrow areas and stockpile/staging area, the westside access road, and eastside trail. The Contra Costa Water District (CCWD) has detailed information about biological resources throughout the watershed, and this was used and updated for the analysis as needed to assess impacts.
- **New Delta Intake and Pump Station and Power Supply Infrastructure:** For these facilities, the study area included the footprint of the facility plus a 150-foot-wide buffer around the site or alignment.
- **Pipelines:** The study area for proposed pipelines was a 500-foot-wide study corridor centered on the alignment. For impact analysis purposes a 200-foot-wide construction easement was assumed for the Delta-Transfer Pipeline and the Transfer Los Vaqueros (-LV Pipeline), while a 300-foot wide construction easement was assumed for the Transfer-Bethany Pipeline.

Facility siting studies were conducted during development of the project alternatives to try to avoid or minimize potential environmental impacts in advance. As discussed in the Environmental Impact Statement/Environmental Impact Report (EIS/EIR), where impacts could not be avoided or minimized to a less-than-significant level through careful siting, mitigation measures have been identified.

This evaluation of biological resources is based on field surveys, aerial photograph interpretation, and database review of vegetation communities, wildlife habitat, and jurisdictional “waters of the United States” that occur or potentially occur in the project vicinity and specific project area, including ecosystems, habitats, plant communities, and special-status plants and wildlife. Extensive field surveys were conducted between 2004 and 2008 to augment existing information on biological resources in the project area and on project sites. Survey work that was completed for the project during this period includes:

- Large branchiopod surveys that were conducted within the Los Vaqueros Watershed, along pipeline alignments, and at project facilities in 2008 (ESA, 2008a);
- In-watershed surveys for valley elderberry longhorn beetle (ESA, 2005);

- Focused botanical surveys of the Delta-Transfer Pipeline, Transfer-LV Pipeline, Expanded Transfer Facility site, and Transfer-Bethany Pipeline from 2004 to 2008 (ESA, 2007; 2008b); and
- Reconnaissance-level wildlife surveys of the Delta Intake Facilities, Delta-Transfer Pipeline, Transfer-LV Pipeline, Transfer-Bethany Pipeline, Western Area Power Administration (Western) substation and powerline alignments, and PG&E substation and powerline alignment by ESA biologists conducted concurrently with botanical and branchiopod surveys in 2007 and 2008.

Regulatory Setting

Many biological resources in California are protected and/or regulated by a variety of laws and policies administered by federal, state, and/or local agencies. The following is an overview of the key agencies, regulations, and policies relevant to the Los Vaqueros Reservoir Expansion Project.

Federal – Special-Status Species

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) administers the Federal Endangered Species Act (FESA) (16 U.S. Code [USC] 153 et seq.), the Migratory Bird Treaty Act (MBTA) (16 USC 703–711), the Bald Eagle Protection Act (16 USC 668), and the Fish and Wildlife Coordination Act (16 USC 661-667e).

Federal Endangered Species Act

FESA Section 7 and Section 10. Under FESA, the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 USC 1533[c]). Two federal agencies oversee FESA: USFWS has jurisdiction over plants, wildlife, and resident fish, and the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NMFS) has jurisdiction over anadromous fish and marine fish and mammals (addressed in Section 4.3, Delta Fisheries and Aquatic Resources). FESA Section 7 mandates that all federal agencies consult with USFWS and NMFS to ensure that federal agency actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species (see the discussion below under Critical Habitat). FESA prohibits the unauthorized "take"[1] of any fish or wildlife species listed as threatened or endangered, including the destruction of habitat that could hinder species recovery.

FESA Section 10 requires the issuance of an incidental take permit before any public or private action may be taken that would harm, harass, injure, kill, capture, collect, or otherwise hurt any individual of an endangered or threatened species. The permit requires preparation and implementation of a habitat conservation plan that provides specific measures to avoid, offset, or minimize impacts on endangered or threatened species.

1 "Take" is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct.

Pursuant to the requirements of FESA, a federal agency reviewing a proposed project within its jurisdiction must determine whether any federally listed threatened or endangered species could be present in the project area, and whether the project action would have a potentially significant effect on such species. In addition, the agency is required to determine whether the project action is likely to jeopardize the continued existence of any species proposed to be listed under FESA, or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3], [4]). Species proposed to be listed and critical habitat proposed for designation are those for which formal proposals have been submitted for agency review; species proposed for listing are distinct from candidate species. Candidate species are those for which USFWS has sufficient biological information to support a proposal to list as endangered or threatened, but a formal proposal has not been made. Candidate species receive "special attention" from federal agencies during environmental review, although they are not protected otherwise under FESA.

USFWS issued three separate Biological Opinions (BOs) to address the effects of the existing Los Vaqueros Reservoir on the San Joaquin kit fox and bald eagle (issued September 3, 1993), California red-legged frog and Alameda whipsnake (issued November 8, 1996), and the longhorn fairy shrimp and vernal pool fairy shrimp (Conference Opinion issued in 1995 and adopted as BO in 1995).

Critical Habitat. USFWS designates critical habitat for listed species under FESA. Critical habitat designations are specific areas within a geographic region that are occupied by a species and determined to be critical to its survival in accordance with FESA. Federal entities issuing permits or acting as a lead agency must show that their actions do not negatively affect the critical habitat to the extent that it impedes the recovery of the species. Portions of the Transfer-Bethany Pipeline are within designated critical habitat for vernal pool fairy shrimp (*Branchinecta lynchi*) and Contra Costa goldfields (*Lasthenia conjugens*). Within designated critical habitat, USFWS protects habitat that provides the primary constituent elements (PCEs) for survival of the listed species. PCEs are the physical and biological functions considered essential to species conservation that require special management considerations or protection. Critical habitat for listed fish is considered separately in Section 4.3, Delta Fisheries and Aquatic Resources.

PCEs for vernal pool fairy shrimp are those habitat components that are essential for the primary biological needs of foraging, sheltering, reproduction, and dispersal (USFWS, 2005a). These PCEs generally coincide with the presence of vernal pools and their associated upland habitat.

The PCEs for Contra Costa goldfields include seasonal wetland habitat (e.g., vernal pools, swales, and other ephemeral wetlands) that provide soil moisture and the specific aquatic environment for plant growth, reproduction, and dispersal, and the associated watershed(s) and hydrologic features that maintain suitable periods of pool inundation, water quality, and soil moisture for Contra Costa goldfields germination, growth, reproduction, and dispersal (USFWS, 2005a).

Protection of Nesting Birds – Migratory Bird Treaty Act

MBTA (16 USC 703, Supp. I, 1989) prohibits the killing, possessing, or trading of migratory birds, bird parts, eggs, and nests, except in accordance with regulations prescribed by the

Secretary of the Interior. The MBTA prohibits direct and indirect acts, though harassment and habitat modification are not included unless they result in direct loss of birds, eggs, or nests. The list of birds covered by MBTA essentially includes all native birds.

Bald Eagle Protection Act

Under the Bald Eagle Protection Act, it is illegal to import, export, take (which includes molest or disturb), sell, purchase, or barter any bald eagle or golden eagle or part thereof.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 661–667e, March 10, 1934, as amended 1946, 1958, 1978, and 1995) requires federal agencies to consult with USFWS, NMFS, and the California Department of Fish and Game (CDFG) before they undertake or approve projects that control or modify surface water. The consultation is intended to prevent the loss of or damage to fish and wildlife in connection with water projects and to develop and improve these resources. Compliance with this act is incorporated into a project's National Environmental Policy Act (NEPA) process. For the current project, the U.S. Bureau of Reclamation (Reclamation) is consulting with USFWS and other agencies to fulfill the requirements of the Fish and Wildlife Coordination Act.

State – Special-Status Species

California Department of Fish and Game

The CDFG administers a number of laws and programs designed to protect fish and wildlife resources, as discussed below.

California Endangered Species Act

The California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et seq.) generally parallels the main provisions of the FESA. CDFG administers the listing and authorizes the "take" of endangered and threatened species under CESA. CDFG may allow a take of such a species through its issuance of permits pursuant to Fish and Game Code Section 2081, except for designated "fully protected" species (see subsection below). Unlike its federal counterpart, CESA protections apply to candidate species that have been petitioned for listing.

Fully Protected Species – Fish and Game Code Sections 3511, 4700, 5050, and 5515

Fully protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take, except for collecting these species for necessary scientific research and relocation of the bird species for the protection of livestock. Many fully protected species have also been listed as threatened or endangered species under the more recent endangered species laws and regulations; however, because the original statutes have not been repealed or amended, the legal protection of "no take" is still applicable.

Protection of Nesting Birds – Fish and Game Code Sections 3503 and 3513

Section 3503.5 states that it is "unlawful to take, possess, or destroy the nests or eggs of any such bird of prey (i.e., species in the orders falconiformes and strigiformes) except as otherwise provided by this code or any other regulation adopted hereto." Section 3513 states that it is also unlawful to take or possess any migratory non-game bird (or part of such migratory non-game bird) as designated in the MBTA. Disturbance that causes nest abandonment and/or reproductive failure is considered a take by CDFG. This statute does not provide for the issuance of an incidental take permit.

Species of Special Concern

CDFG maintains lists for candidate-endangered species and candidate-threatened species. California candidate species are afforded the same level of protection as listed species. California also designates species of special concern, which are species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. These species do not have the same legal protection as listed species or fully protected species, but may be added to official lists in the future. CDFG intends the species of special concern list to be a management tool for consideration in future land use decisions.

Native Plant Protection Act

California Fish and Game Code Section 1900–1913, also known as the Native Plant Protection Act, is intended to preserve, protect, and enhance endangered or rare native plants in California. The act directs CDFG to establish criteria for determining what native plants are rare or endangered. Under Section 1901, a species is endangered when its prospects for survival and reproduction are in immediate jeopardy from one or more causes. A species is rare when, although not threatened with immediate extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens. The act also directs the California Fish and Game Commission to adopt regulations governing the taking, possessing, propagation, or sale of any endangered or rare native plant.

Vascular plants identified as rare or endangered by the California Native Plant Society (CNPS) (Skinner and Pavlik, 1994), but which may have no designated status or protection under federal or state endangered species legislation, are defined as follows:

- **List 1A:** Plants presumed extinct
- **List 1B:** Plants rare, threatened, or endangered in California and elsewhere
- **List 2:** Plants rare, threatened, or endangered in California, but more numerous elsewhere
- **List 3:** Plants about which more information is needed (a review list)
- **List 4:** Plants of limited distribution (a watch list)

In general, plants appearing on CNPS Lists 1A, 1B, or 2 are considered to meet the criteria of endangered, rare, or threatened under the California Environmental Quality Act (CEQA) Guidelines Section 15380. Additionally, plants identified on CNPS Lists 1A, 1B, or 2 meet the definition of Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (CESA) of the California Fish and Game Code as rare or endangered species.

Federal – Wetlands

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) administers Section 404 of the Clean Water Act (CWA). Section 404 regulates activities in wetlands and "other waters of the United States." Wetlands are a subset of "waters of the United States" that are defined in the Code of Federal Regulations (CFR) (33 CFR 328.3[a]; 40 CFR 230.3[s]) as:

1. All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide.

2. All interstate waters including interstate wetlands. (Wetlands are defined by the federal government [33 CFR 328.3(b), 1991] as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted for life in saturated soil conditions.)

3. All other waters—such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds—the use, degradation, or destruction of which could affect interstate or foreign commerce. This includes any waters with the following current or potential uses:

   - That are or could be used by interstate or foreign travelers for recreational or other purposes,
   - From which fish or shellfish are or could be taken and sold in interstate or foreign commerce, or
   - That are used or could be used for industrial purposes by industries in interstate commerce.

4. All impoundments of waters otherwise defined as waters of the United States under the definition.

5. Tributaries of waters identified in paragraphs (1) through (4).

6. Territorial seas.

7. Wetlands next to waters identified in paragraphs (1) through (6).

8. Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding the Clean Water Act jurisdiction remains with the U. S. Environmental Protection Agency (328.3[a][8] added 58 CFR 45035, August 25, 1993).

State – Wetlands

Policies and Regulations

CDFG regulates activities that would interfere with the natural flow of, or substantially alter, the channel, bed, or bank of a lake, river, or stream. The regulatory definition of a stream is a body of water that flows at least periodically or intermittently through a bed or channel having banks, and supports wildlife, fish, or other aquatic life. These activities are regulated under California Fish and Game Code Section 1602. Requirements to protect the integrity of biological resources and water quality are often conditions of Streambed Alteration Agreements. Requirements may include avoidance or minimization of the use of heavy equipment, limitations on work periods to avoid impacts on wildlife and fishery resources, and measures to restore degraded sites or compensate for permanent habitat losses.

CALFED Species and Habitat Planning Guidance

CALFED Multi-Species Conservation Strategy

The CALFED Multi-Species Conservation Strategy (MSCS) is a programmatic document developed in 2000 for the CALFED Bay-Delta Program (CALFED) to comply with FESA, CESA, and California's Natural Community Conservation Planning Act. The MSCS provides a comprehensive planning strategy for the conservation of plants, fish, and wildlife that may be affected by elements of the CALFED Bay-Delta Program, such as the Ecosystem Restoration Program, the Environmental Water Account, Conveyance and Storage.

CALFED Natural Community Conservation Plan

The CALFED Natural Community Conservation Plan (NCCP) was approved in June 2000, and an NCCP permit was issued in September 2004 for the Environmental Water Account. The program is a cooperative effort administered by CDFG as one of 25 contributing state and federal agencies to improve the quality and reliability of California's water supplies while restoring the Bay-Delta ecosystem to protect habitats and species.

Local

East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan

The East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan (East County HCP/NCCP), approved in July 2007, provides a comprehensive framework for species and ecosystem conservation, short- and long-term local land use decision-making in a rapidly urbanizing region, and environmental permitting processes. The East County HCP/NCCP was developed by the East Contra Costa County Habitat Conservation Plan Association (East County HCPA), which was formed in 2000. The East County HCPA was a Joint Powers Authority consisting of seven entities: Contra Costa County, CCWD, East Bay Regional Park District, and the Cities of Brentwood, Clayton, Oakley, and Pittsburg. Upon approval of the HCP/NCCP and issuance of the permits, the HCPA ceased to exist, and implementation of the plan is now managed by the East Contra Costa County Habitat Conservancy, which is composed of Contra Costa County and the cities of Brentwood, Clayton, Oakley, and Pittsburg. The Los Vaqueros Reservoir Expansion Project is not a covered action under the East County HCP/NCCP, but the Los Vaqueros Watershed is within the biological inventory area of the HCP/NCCP.

The East County HCP/NCCP's primary goals are to prevent or minimize incidental take of covered species under FESA and CESA from reasonable and expected urban growth and to provide adequate safeguards for the protection of covered species in the plan area. As part of the East County HCP/NCCP approval, the East Contra Costa County Habitat Conservancy received permits from USFWS and CDFG authorizing incidental take. Participating local jurisdictions will be able to authorize development and other activities without proposing additional mitigation or conservation measures for covered species. The take permits are for 30 years, which coincides with the timeline applicable to all assessments made in the plan.

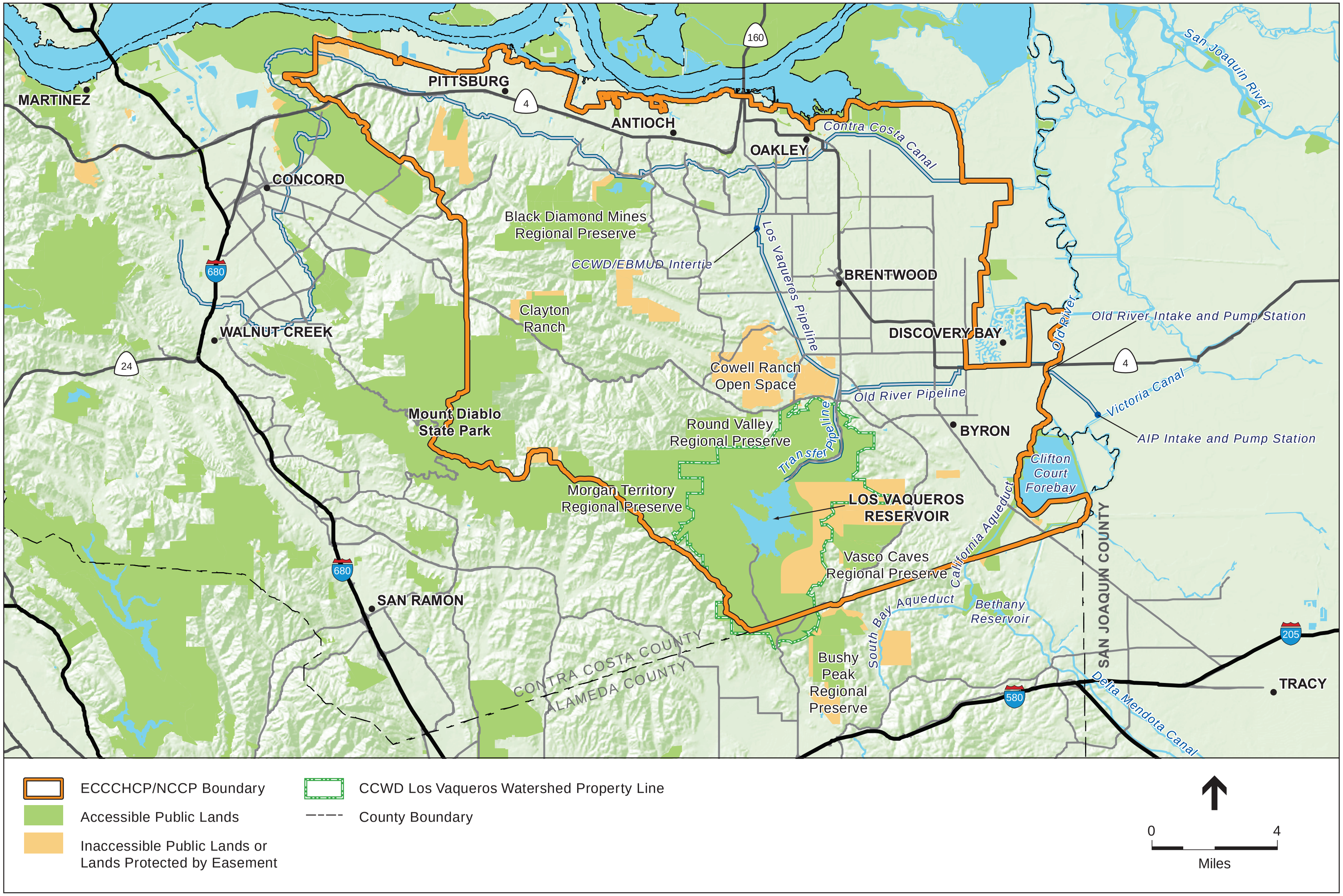
The East County HCP/NCCP's geographic scope or "inventory area," the area covered in the impact evaluation and by the conservation plan, is in eastern Contra Costa County (see **Figure 4.6-1**). The inventory area covers about one-third (173,680 acres) of the 435,000-acre Contra Costa County and consists primarily of unincorporated agricultural and public lands. A combination of political, ecological, and hydrologic (watershed and shoreline) boundaries defines the inventory area.

A list of 154 special-status species with known or potential occurrence in the inventory area was evaluated for coverage under the East County HCP/NCCP. A subset of 26 species (both listed and not listed) meeting certain regulatory and ecological criteria is covered by the East County HCP/NCCP. Two of the covered species, the San Joaquin kit fox *(Vulpes macrotis mutica)* and Alameda whipsnake (*Masticophis flagellum ruddocki*), have greatly influenced landscape-level planning because of their life histories and/or specialized habitat requirements. Some of the other species covered include the California red-legged frog (*Rana draytonii*), giant garter snake (*Thamnophis gigas*), western burrowing owl (*Athene cunicularia*), four species of fairy shrimp, and 10 plant species. The plan includes conservation measures for all 26 species, whether or not they are currently listed. Five major terrestrial vegetation communities meeting the East County HCP/NCCP requirement to identify communities that provide ecological functions and values that could be affected by plan implementation are covered.

Covered communities include grassland, chaparral/scrub, oak woodland, riparian woodland/scrub, and irrigated agriculture. The grassland community is most abundant and serves as a core vegetation community in the inventory area. The plan area includes critical habitat for several covered species and provides ecological linkages between other covered species and their habitats.

The East County HCP/NCCP's conservation strategy is based on principles of conservation biology, including an ecosystem approach that highlights creation of a new preserve system to provide ecological landscape connectivity. Conservation actions to be conducted under the East County HCP/NCCP include land acquisition, habitat enhancement and restoration, species population enhancement, and impact avoidance and minimization. Preserves would be managed to achieve the biological goals and objectives contained in the East County HCP/NCCP for each covered species and vegetation community.

Conservation measures are proposed at three spatial scales: landscape, vegetation community, and species. The strategy is also designed to meet the regulatory requirements of both state and federal regulations governing sensitive biological resources.



SOURCE: USGS, 1993 (base map); Contra Costa County, 2005; East County HCPA, 2006; and ESA, 2007

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Figure 4.6-1
Regional Conservation Planning and Public Lands

Contra Costa County General Plan

The Contra Costa County General Plan designates 41 areas as Significant Ecological Resource Areas. These areas are defined by the presence of rare, threatened, or endangered species; unique natural areas; or wetlands and marshes. Of the designated areas, six are within the regional project vicinity. Near the watershed are areas of native bunchgrass (Area 26); historical eagle nests, outstanding natural features, and habitat for several sensitive plant and animal species (Area 30); and alkali meadows and northern claypan vernal pools (Area 29, within Area 30). Additionally, north of the watershed (Area 28) is habitat for a wide variety of sensitive plant and animal species in the Marsh Creek riparian corridor and reservoir. Byron Hot Springs (Area 38), which contains alkali mudflats, salt marshes, and hot mineral springs, is just east of the Transfer-Bethany Pipeline, north of Armstrong Road.

The Contra Costa County General Plan contains numerous goals, policies, and programs related to protection of wildlife and vegetation. Goals and policies include: protection of rare, threatened, and endangered species (8-D); preservation and restoration of the San Francisco Bay–Delta estuary and adjacent lands supporting fisheries and waterfowl (8-F); identification and protection of seasonal wetlands in grassland areas (8-27); preservation of natural woodlands (8-12); and retention of existing vegetation and wildlife habitat areas in large open areas sufficient to support wildlife populations (8-15). A list of goals and policies related to biological resources is included in Appendix E.

Alameda County General Plan (East County Area Plan)

The Alameda County General Plan (East County Area Plan) contains goals and policies relevant to preserving or protecting trees and wildlife habitat. Provisions include preservation of areas known to support special-status species (Policy 125), protection of riparian and seasonal wetlands (Policy 126), and preservation of East County oak woodland plant communities and riparian woodland habitat (Alameda County, 2002). Specific goals and policies in the East County Area Plan are provided in Appendix E.

Environmental Setting

Regional Setting

The project alternatives are in southeastern Contra Costa County and northeastern Alameda County in the California Floristic Province. This area is characterized by a Mediterranean climate with steep to rolling hills of the eastern Diablo Range and a portion of the southern Delta. Vegetation is a mosaic of annual grasslands, croplands, oak woodlands, upland scrubs, wetland communities, and riparian scrubs and forests.

Within the Los Vaqueros Watershed, valley/foothill woodland and forest, annual grasslands, upland scrub, aquatic, and riparian vegetation dominate the landscape. The Central Valley portions of the pipeline corridors are characterized by annual grasslands, upland croplands, intermittent streams, and seasonal wetlands. Current principal land uses vary within the watershed and along pipeline corridors, and include agriculture, pasture lands, cattle grazing, and open space. Project activities are principally in undeveloped areas that support minimal or low-density residential, commercial, and industrial development.

Existing Environment

Vegetation Communities and Wildlife Habitats

Vegetation communities are assemblages of plant species that occur together in the same area, which are defined by species composition and relative abundance. To characterize plant communities in the Los Vaqueros Watershed, vegetation series were mapped using the Sawyer and Keeler-Wolf (1995) classification system (see **Figure 4.6-2**). Outside the watershed, the evaluation was based on the broader habitat classification system developed by the East County HCP/NCCP.

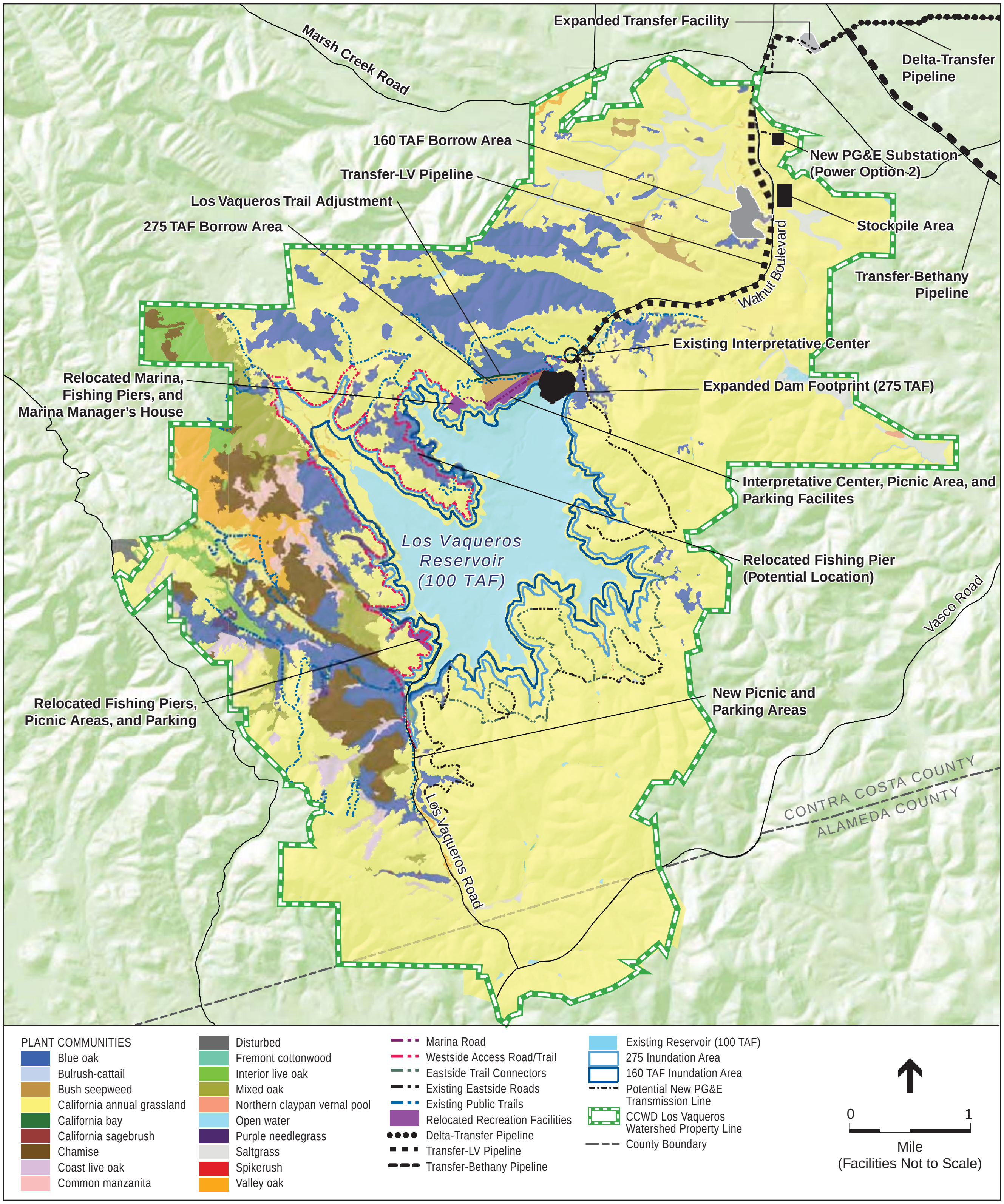
To establish a consistent approach to vegetation and habitat classification throughout the study area, and to be compatible with CALFED Bay-Delta Program guidelines for habitat mitigation, plant community and habitat descriptions are presented for in-watershed and out-of-watershed areas using CALFED NCCP habitat types. The CALFED Ecosystem Restoration Program Plan uses this classification system for evaluating ecosystems, broad habitats, and ecological functions within the CALFED planning area.

The CALFED NCCP habitat types generally correlate with vegetation communities in the Sawyer and Keeler-Wolf system (see **Table 4.6-1**). These communities also share a relationship with wildlife habitat types, which were classified and evaluated using CDFG's *Guide to Wildlife Habitats of California* (Mayer and Laudenslayer, 1988). The CALFED NCCP habitat types are used as the overarching classification system for this analysis as described in Table 4.6-1.

Grassland. Grassland habitat includes perennial and alkali grassland habitat and the much more extensive annual grassland vegetation. Grasslands are the most common habitat type in the study area, both within and outside the watershed, and often occur in association with Valley/foothill woodland habitat. Annual grasslands are often found in areas that have been grazed or were once croplands. This is the most common habitat type in the Los Vaqueros Watershed and on pipeline corridors, with habitat quality varying from disturbed ruderal vegetation to relatively intact communities.

The most common species in this community include wild oats (*Avena fatua*), ripgut brome (*Bromus diandrus*), yellow star-thistle (*Centaurea solstitialis*), fescue (*Vulpia myuros*), filaree (*Erodium* sp.), and mustards (*Brassica* and *Hirschfeldia* spp.). Native wildflowers may also occur within the annual grassland community and may include fiddleneck (*Amsinckia* spp.), lupine (*Lupinus* spp.), popcorn flower (*Plagiobothrys* spp.), and California poppy (*Eschscholzia californica*), among many others. Grasslands in the project study area support a substantial number of non-native invasive plant species including yellow star-thistle and medusahead (*Taeniatherum caput-medusae*).

Many wildlife species use both native and non-native grasslands for refugia, nesting, and as foraging habitat. Reptiles commonly found in grasslands include the western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), and western rattlesnake (*Crotalus viridis*). Most project area grasslands also provide habitat for the California tiger salamander (*Ambystoma californiense*). Bird species that nest in project area grasslands include northern harrier (*Circus cyaneus*), burrowing owl, western meadowlark (*Sturnella neglecta*), and California horned lark (*Eremophila alpestris*).



SOURCE: USGS, 1993 (base map); ESRI, 2006; CCWD, 2007; CCC, 2007; MWH, 2007; and ESA, 2008

Figure 4.6-2
Distribution of Plant Communities and Habitats in the Los Vaqueros Watershed

TABLE 4.6-1
PLANT COMMUNITIES AND HABITATS IN THE LOS VAQUEROS WATERSHED

NCCP Habitat Types	Acres	Sawyer and Keeler-Wolf Vegetation Series	Acres
Lacustrine	1,489.05	Open water	1,489.05
Nontidal Freshwater Permanent Emergent	54.66	Bulrush-cattail series[a]	50.54
		Spikerush	4.13
Natural Seasonal Wetland	299.95	Northern claypan vernal pool[a]	4.36
		Bush seepweed series[a]	50.27
		Saltgrass series[a, b]	245.31
Valley/Foothill Riparian	68.97	Fremont cottonwood series[a]	7.10
		Valley oak series[a]	67.93
Grassland	12,819.17	California annual grassland series	12,790.20
		Purple needlegrass series[a]	28.97
Upland Scrub	775.33	Common manzanita	161.08
		California sagebrush series	17.38
		Chamise series	596.88
Valley/Foothill Woodland Forest	3,008.77	Blue oak series[a]	1,941.10
		Mixed oak series	756.47
		Interior live oak series	122.69
		Coast live oak series	181.64
		California bay series	0.81
Urban/Disturbed	19.12	Disturbed	19.12
Total	**18,535.02**		**18,535.02**

a Classified as “Sensitive” by CDFG and/or CALFED.
b Includes alkali wetlands and meadow habitats.

SOURCE: ESA unpublished data, 2006-2008

Birds that commonly forage in grasslands include the turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and white-tailed kite (*Elanus leucurus*). Mammal species known to inhabit study area grasslands include the western harvest mouse (*Reithrodontomys megalotis*), California ground squirrel (*Spermophilus beecheyi*), black-tailed jackrabbit (*Lepus californicus*), and black-tailed deer (*Odocoileus hemionus columbianus*). San Joaquin kit fox are sparsely distributed throughout the region in annual grasslands habitat, and also use adjacent oak woodlands, riparian woodlands, and other habitats.

Valley/Foothill Riparian. Valley/foothill riparian habitat consists of all successional stages of woody vegetation, commonly dominated by willow (*Salix* spp.), Fremont cottonwood (*Populus fremontii*), valley oak (*Quercus lobata*), or sycamore (*Plantanus racemosa*), within the active and historical floodplains of low-gradient reaches of streams and rivers generally below a 300-foot elevation. Valley/foothill riparian habitat includes riparian and riverine aquatic habitat.

Arroyo willow habitat occurs in Kellogg Creek, both within the watershed and in downstream reaches. This habitat type is characterized by riparian scrub dominated by arroyo willow (*Salix lasiolepis*) and red willow (*Salix laevigata*). Associated species found within this habitat include California black walnut (*Juglans californica*), California buckeye (*Aesculus californica*), Mexican elderberry (*Sambucus mexicana*), and Himalayan blackberry (*Rubus discolor*). This vegetation community often occurs in association with valley oak habitat along Kellogg Creek's banks.

Riparian areas provide important nesting and foraging habitat for many amphibians, reptiles, birds, and mammals including special-status species such as the California red-legged frog. These areas are also movement and dispersal corridors, allowing animals to move from upland and other aquatic habitats within the watershed.

A riparian forest/riparian scrub vegetation community occurs along Kellogg Creek's banks. This vegetation community is characterized by riparian vegetation dominated by sycamore, valley oak, mulefat (*Baccharis salicifolia*), and willow. This vegetation type often transitions into the arroyo willow habitat when gravel bars develop and willows are able to establish.

Upland Scrub. Upland scrub habitat includes habitat areas dominated by shrubs characteristic of chaparral and coastal scrub communities. East- and north-facing steep, rocky slopes and ridge tops in the western portion of the Los Vaqueros Watershed are characterized by chaparral and, to a lesser degree, coastal scrub. Chaparral is dominated by evergreen shrubs, generally with little or no herbaceous ground cover or overstory trees. Chamise (*Adenostoma fasciculatum)* is usually the dominant or codominant species throughout chaparral, although in some areas it is absent. Gaps in the dense shrub community support grassland species, both from the annual grassland series and the purple needlegrass series. Coastal scrub occurs on arid south-facing slopes in the watershed. This community is typically composed of California sagebrush (*Artemesia californica*) and chamise as codominants, with lesser amounts of black sage (*Salvia mellifera*), poison oak, bush monkey flower (*Mimulus aurantiacus*), and California buckwheat (*Eriogonum fasciculatum* var. *foliolosum*). Canopy openings support annual grassland species. Upland scrub habitat is limited to the upper Los Vaqueros Watershed, west of Los Vaqueros Dam.

Characteristic wildlife species in chaparral and scrub habitat include the western fence lizard, common garter snake, common kingsnake (*Lampropeltis getulus*), western rattlesnake, California quail (*Callipepla californica*), western scrub-jay (*Aphelocoma californica*), bushtit (*Psaltriparus minumus*), California thrasher (*Toxostoma redivivum*), spotted towhee (*Pipilo maculatus*), sage sparrow (*Amphispiza belli*), California mouse (*Peromyscus californicus*), deer mouse (*Peromyscus maniculatus*), and the introduced wild pig (*Sus scrofa*). Alameda whipsnakes are typically found in chaparral and coastal scrub habitat, though their home ranges also include adjacent grassland, oak woodlands, and other habitats (USFWS, 2002; CDFG, 2005).

Valley/Foothill Woodland and Forest. Valley/foothill woodland and forest habitat consists of non-riparian forest, woodland, and savannas. These vegetation communities commonly occur in the study area in the Los Vaqueros Watershed and are dominated by blue oak (*Quercus douglasii*), valley oak, interior live oak (*Q. wislizeni*), and coast live oak (*Q. agrifolia*).

Woodland habitat is typically found on higher slopes and ridgetops where soils are well-drained. The dominant tree species in the watershed is blue oak. Other tree species typically found in this habitat type include California bay laurel (*Umbellularia californica*) and California buckeye. This habitat occurs in patches throughout the watershed and is most prevalent in areas west and north of the Los Vaqueros Reservoir.

Woodland and forest habitat provide food, cover, and nesting sites for many wildlife species. Bird species typically found in oak woodlands include the acorn woodpecker (*Melanerpes formicivorus*), bushtit, oak titmouse (*Baeolophus inornatus*), and hermit thrush (*Catharus guttatus*). Cavity nesting birds and many raptor species rely on oaks and oak woodlands for nesting sites.

Upland Cropland. Upland cropland habitat consists of agricultural lands farmed for feed and grain, produce, orchard crops, and other crops that are not seasonally flooded. This habitat type occurs in and near major portions of the Delta-Transfer Pipeline alignment and Power Options 1 and 2. Croplands on the pipeline alignment are closely situated to grassland habitats and freshwater permanent emergent habitat. Thus, many of the wildlife species associated with these habitats also forage in croplands. Common species occurring in cropland include small mammals such as voles and mice, and birds such as mourning doves, pheasants, and several blackbird species. Croplands are important foraging habitats for numerous raptors including the red-tailed hawk, northern harrier, and white-tailed kite.

Upland cropland habitat includes farmed land along the Delta-Transfer Pipeline and in the vicinity of the Old River Intake and Pump Station and the new Delta Intake and Pump Station. Crops in the study area include tomatoes, alfalfa, corn, and hay, and orchards of English walnut and persimmon.

Lacustrine. Lacustrine habitats are permanent water bodies that do not support emergent vegetation and are not subject to tidal exchange; they, include lakes, ponds, oxbows, gravel pits, and flooded islands. Los Vaqueros Reservoir is an engineered feature characterized by lacustrine habitat. Aquatic habitat quality for fish is low to moderate due to poorly developed cover vegetation along the shoreline. The reservoir has been stocked with more than 300,000 game fish, principally rainbow trout (*Oncorhynchus mykiss*) and Kokanee (sockeye) salmon (*Oncorhynchus nerka*). Other fish introduced to the reservoir include striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), sunfish (*Lepomis* sp.), brown bullhead catfish (*Ameiurus nebulosus*), and channel catfish (*Ictalurus punctatus*), among others.

Waterfowl species that forage, overwinter, rear their brood, or otherwise rely on lacustrine habitat in the reservoir at some time during the year include the Canada goose (*Branta canadensis*), wood duck (*Aix sponsa*), gadwall (*Anas strepera*), American wigeon (*A. americana*), mallard (*A. platyrhinchos*), northern shoveler (*A. clypeata*), northern pintail (*A. acuta*), green-winged teal (*A. carolinensis*), canvasback (*Aythya valisineria*), redhead, ring-necked duck (*A. collaris*), greater scaup (*A. marila*), lesser scaup (*A. affinis*), bufflehead (*Bucephala albeola*), common goldeneye (*B. clangula*), hooded merganser (*Lophodytes cucullatus*), common merganser (*Mergus merganser americanus*), and ruddy duck (*Oxyura jamaicensis*) (CCWD file data). Other birds at or near the reservoir include grebes, sandpipers, pelicans, cormorants, egrets, herons, and gulls. Birds use the reservoir throughout the year, although unlike water bodies in Southern California, the site is not used as a long-term stopover.

Riverine (Tidal Perennial Aquatic). Old River is the principal deepwater aquatic feature that supplies water to the Los Vaqueros Reservoir. Though tidally influenced, this wide delta channel principally supports freshwater habitat. Its banks support a mélange of natural earthen berm, armored riprap, and sporadic growth of emergent vegetation. Dense riparian vegetation is nonexistent in the project study area. However, portions of the project study area on the fringes of Old River support extensive emergent vegetation such as cattails. Common wildlife species typically found in this habitat include the pacific chorus frog (*Pseudacris regilla*), western toad (*Bufo boreas*), garter snake, and bird species adapted to riparian environments such as the snowy egret (*Egretta thula*), great blue heron (*Ardea herodias*), and black phoebe (*Sayornis nigricans*). A discussion of fisheries resources in Old River can be found in Section 4.3, Delta Fisheries and Aquatic Resources.

Nontidal Freshwater Permanent Emergent. Nontidal freshwater permanent emergent habitat consists of permanent (natural and managed) wetlands, including meadows dominated by wetland plant species that are not tolerant of saline or brackish conditions. Within this habitat type, bulrush (*Scirpus* spp.) and cattails (*Typha latifolia* and *T. angustifolia*) are found in areas that are wet year-round, such as ponds (natural or engineered); shallow edges of lakes, pools, and stock ponds; and in seasonal drainages and riparian areas such as Kellogg Creek. Such habitat occurs intermittently in drainage ditches in agricultural areas and several natural drainages along pipeline routes. This habitat type occurs in stream channels and created ponds in the Los Vaqueros Watershed, in agricultural channels near the Delta Intake Facilities, and in natural and created channels along pipeline corridors and transmission line corridors associated with Power Options 1 and 2.

Wildlife species that typically use this habitat type include the pacific chorus frog, California red-legged frog, and western pond turtle (*Actinemys marmorata*). Common bird species using this habitat include the marsh wren (*Cistothorus palustris*), common yellowthroat (*Geothlypis trichas*), and red-winged blackbird (*Agelaius phoeniceus*). Mammals may use these aquatic features for water or forage.

Natural Seasonal Wetland. Natural seasonal wetland habitat consists of vernal pools, alkali marshes, alkali sink scrub habitats, and other unmanaged seasonal wetlands with natural hydrologic conditions. They are dominated by herbaceous vegetation and pond surface water or maintain saturated soils at the ground surface for enough of the year to support facultative or obligate wetland plant species.

Vernal pools are seasonal wetlands that occur in grasslands. These wetlands are typically found in slight depressions that form over bedrock or hardpan soils that allow water to pool during winter and spring rains. Vernal pools typically have an impervious layer of silicate-based hardpan underlying them that prevents water from percolating into the soil. Although vernal pools occur naturally in grassland and woodland settings, they may also occupy disturbed locations where the underlying soil conditions remain intact. Vernal pools are considered unique habitat and often support species that are endemic to vernal pools or other shallow pools in that particular geographic region. Vernal pool communities have been greatly reduced due to conversion of grasslands to agriculture or urban development and are identified as a Significant Natural Community by CDFG. Many vernal pool-dependent plants and animal species receive special-status protection by the state or federal government. Plant species common to vernal pools include coyote thistle (*Eryngium* spp.), dwarf blennosperma (*Blennosperma nanum*), spike rush (*Eleocharis* spp.), and California hairgrass (*Deschampsia danthonioides*). Vernal pool conditions occur in a portion of the Transfer-Bethany Pipeline alignment on Armstrong Road near Byron Airport, and in areas farther south along this alignment.

Vernal pool communities provide habitat for wildlife species that are adapted to seasonal ponding and drying, including the California tiger salamander and vernal pool fairy shrimp.

Alkali marshes and alkali sink scrub habitat occur within some grasslands in limited locations and favor a unique set of characteristics. Alkali meadows form in shallow basins where soils are particularly alkaline relative to surrounding grasslands and where soil types are seasonally inundated and slow to drain. Commonly dominated by saltgrass (*Distichlis spicata*), saline emergent habitat also supports hare barely (*Hordeum marinum*), alkali heath (*Frankenia salina*), toad rush (*Juncus bufonius*) and, less frequently, iodine bush (*Allenrolfea occidentalis*). Plant species found in alkali meadows are typically adapted to soil conditions and seasonal ponding. Common or ruderal species that may occur within the alkali meadow community include curly dock (*Rumex crispus*) and Italian ryegrass (*Lolium multiflorum*), with heartscale (*Atriplex cordulata*) and San Joaquin saltbush (*Atriplex joaquiniana*) as less common special-status species.

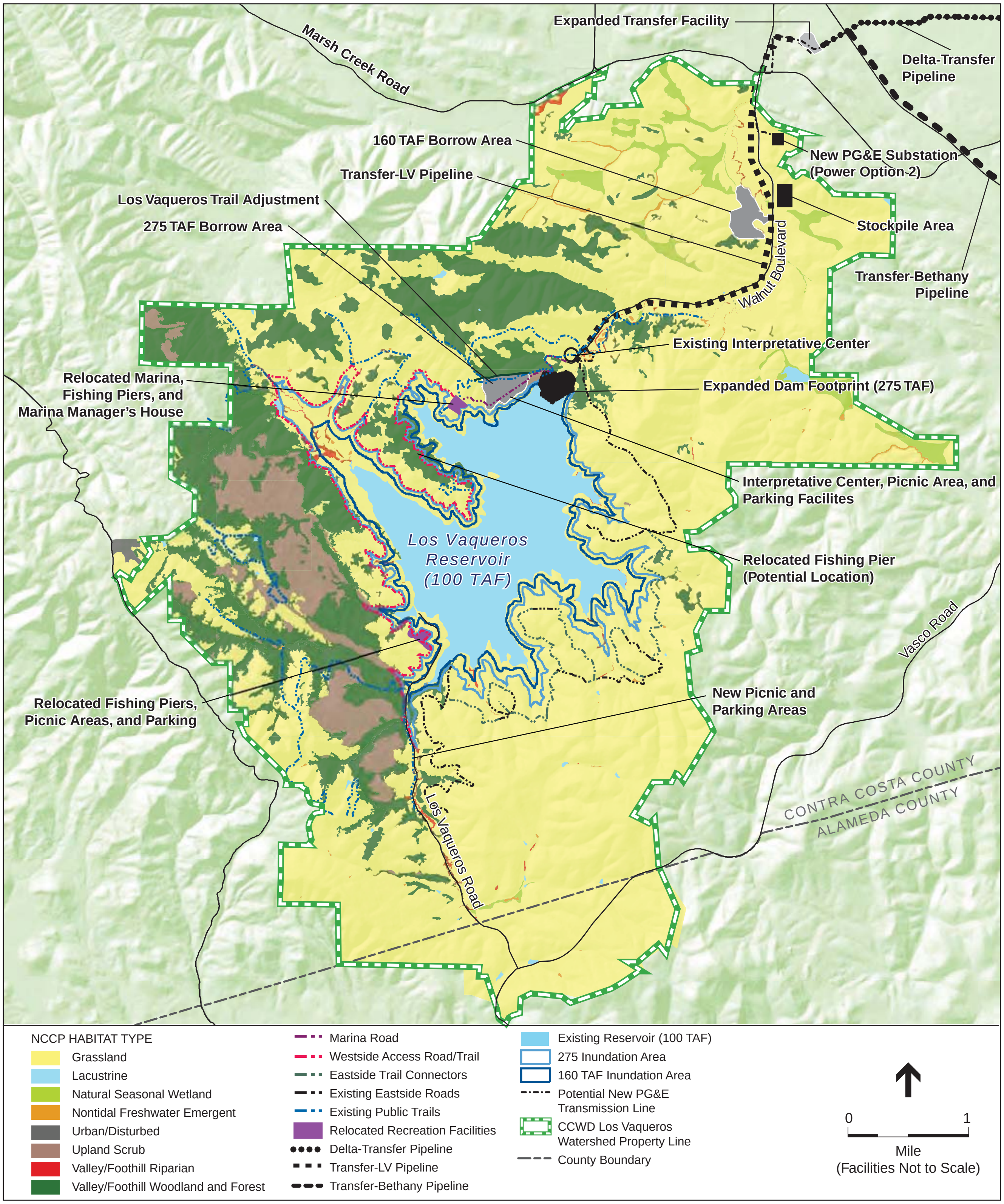
Alkali meadows support wildlife species that are adapted to seasonal ponding and may include the California tiger salamander and vernal pool fairy shrimp.

Within the watershed, alkali marsh habitat occurs within and next to the 15-acre stockpile/staging area and north of the 160-thousand acre-feet (TAF) borrow area. Such habitat also occurs outside the watershed, in isolated pockets on the Delta-Transfer Pipeline south of State Route (SR) 4, and on the Transfer-Bethany Pipeline alignment near Byron Airport.

NCCP Plant Communities and Habitats in the Los Vaqueros Watershed

The Los Vaqueros Watershed encompasses 18,535 acres of land and 20 distinct Sawyer-Keeler-Wolf vegetation series (ESA, 2004; Sawyer and Keeler-Wolf, 1995) (see Table 4.6-1). Plant communities are further detailed in Appendix D. The watershed includes 1,489 acres of open-water habitat. The distribution and extent of plant communities in the watershed and corresponding CALFED NCCP habitat types are presented on **Figure 4.6-3** and in Table 4.6-1.

Grasslands, including annual and native grasslands, are the most abundant NCCP habitat types in the watershed and cover more than 12,819 acres (see Table 4.6-1). Valley/foothill woodland and forest is the next most abundant habitat type, which mostly includes oak woodlands; blue oak



SOURCE: USGS, 1993 (base map); ESRI, 2006; CCWD, 2007; CCC, 2007; MWH, 2007; and ESA, 2008

Figure 4.6-
Distribution of NCCP Habitats in the Los Vaqueros Watershed

is the most common oak woodland type within the watershed. The 3,009 acres of valley/foothill woodland forest habitat are distributed primarily in the western and northern regions of the watershed. Upland scrub habitats are most abundant on the western side of the watershed and cover 775 acres. Natural seasonal wetland habitat covers roughly 300 acres of habitat and includes just over 295 acres of alkali wetlands. Alkali wetlands are dominated by a variety of salt-tolerant plants such as saltgrass, bulrush, cattails (*Typha* spp.), and seepweed (*Suaeda moquinii*). Natural seasonal wetland habitat is also represented by vernal pools in the eastern portion of the watershed.

Nontidal freshwater and saline emergent habitat covers nearly 55 acres of land in the watershed, and occurs mostly in created wetlands and stock ponds. Valley/foothill riparian habitat is predominantly represented by valley oak woodlands, though some areas are dominated by Fremont cottonwood. This habitat type covers nearly 69 acres and primarily occurs along Kellogg Creek both north and south of the reservoir as well as along Adobe Creek in the northwestern part of the watershed.

NCCP Plant Communities For Facilities Outside of the CCWD Watershed

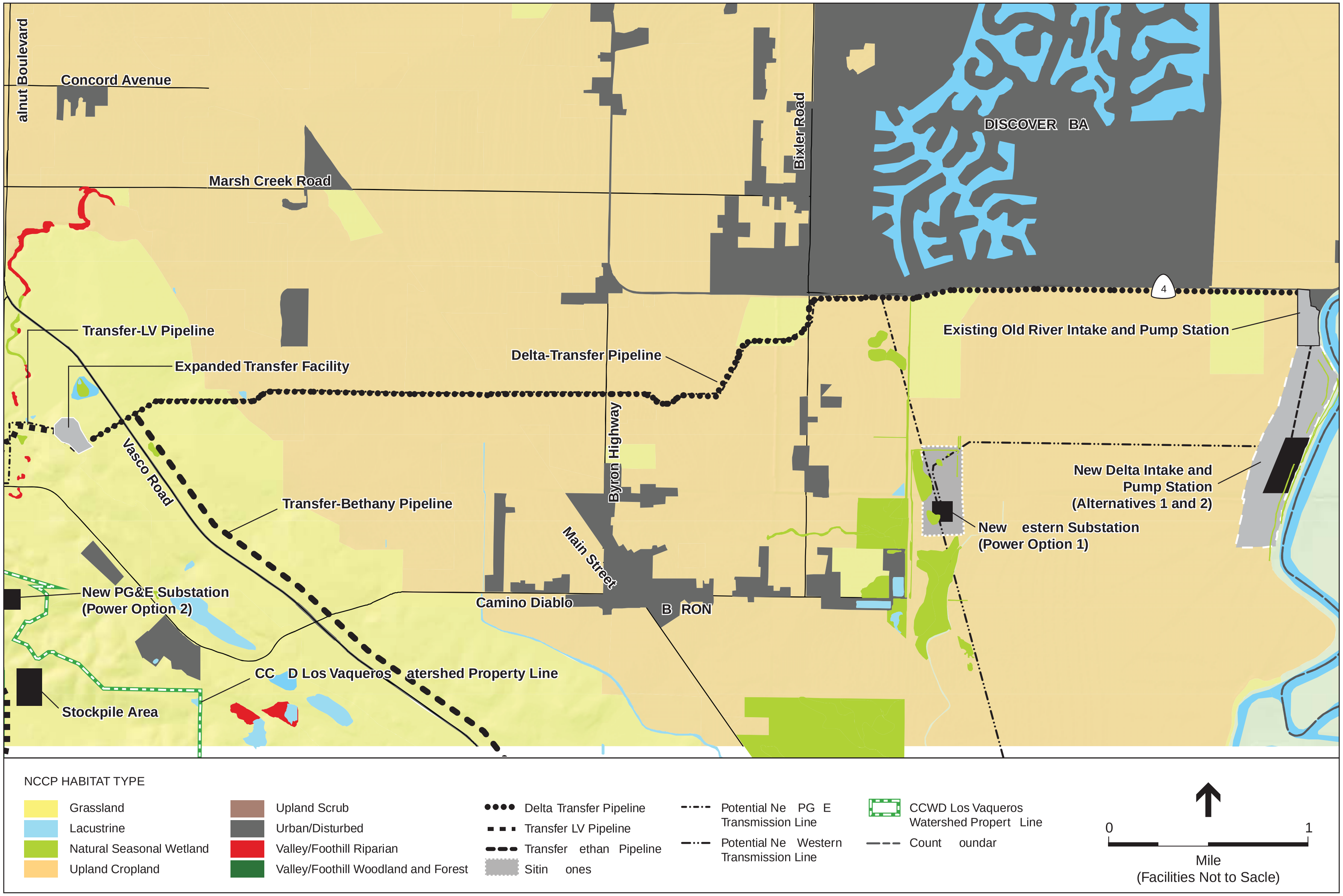
Delta Intake Facilities. The CALFED NCCP habitat types that occur in the new Delta Intake and Pump Station study area along Old River are upland cropland and tidal freshwater emergent (see **Figure 4.6-4** and **Table 4.6-2**).

TABLE 4.6-2
NCCP PLANT COMMUNITIES/HABITATS TYPES
FOR FACILITIES OUTSIDE OF THE WATERSHED (ACRES)

	Pipelines				Facilities			
NCCP Plant Community/ Habitat Type	**Delta-Transfer**	**Transfer-LV**	**Transfer-Bethany**	**Expanded Old River Intake and Pump Station**	**New Delta Intake and Pump Station**	**Expanded Transfer Facility**	**Power Option 1**	**Power Option 2**
Tidal Freshwater Emergent	0	0	0	0	<0.1	0	0	0
Natural Seasonal Wetland	0	0.01	19.84	0	0	0	0	0
Valley/Foothill Riparian	0	0.01	0	0	0	0	0	0
Grassland	39.38	19.61	154.93	0	0	11.55	2.0	2.0
Valley/Foothill Woodland and Forest	0.13	0	0	0	0	0	0	0
Upland Cropland	113.53	0	0	7.45	22.70	0	0	0

LV = Los Vaqueros]

SOURCE: ESA unpublished data, 2006-2008



SOURCE: USGS, 1993 (base map); and ESA, 2008

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Figure 4.6-4
Distribution of NCCP Habitats in the Vicinit of the Delta Inta e Facilities, Delta Transfer Pipeline, and the Expanded Transfer Facilit

Pipelines. The Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline study areas[2] support the following CALFED NCCP habitat types (see Figures 4.6-4 and **4.6-5**, and Table 4.6-2): natural seasonal wetland, valley/foothill riparian, grassland, valley/foothill woodland and forest, and upland cropland.

Transfer Facility. Grasslands are the only vegetation type in the Expanded Transfer Facility study area.

Power Supply Infrastructure. Under Power Option 1, a new substation would be placed within annual grasslands that are surrounded by irrigated pasturelands and upland cropland. From the new substation, the powerline alignment to the Delta Intakes principally traverses upland cropland and annual grassland habitat types and contains natural seasonal wetland habitat in and around irrigation ditches that would be spanned by the powerlines. Under Power Option 2, the Western powerline alignment would traverse within the 230-kilovolt transmission line corridor from the Tracy substation to supply power to the Delta Intakes. These facilities would traverse irrigated pasturelands, upland cropland, and annual grasslands. Pacific Gas and Electric (PG&E) facilities, including distribution lines and a substation, are entirely within annual grasslands.

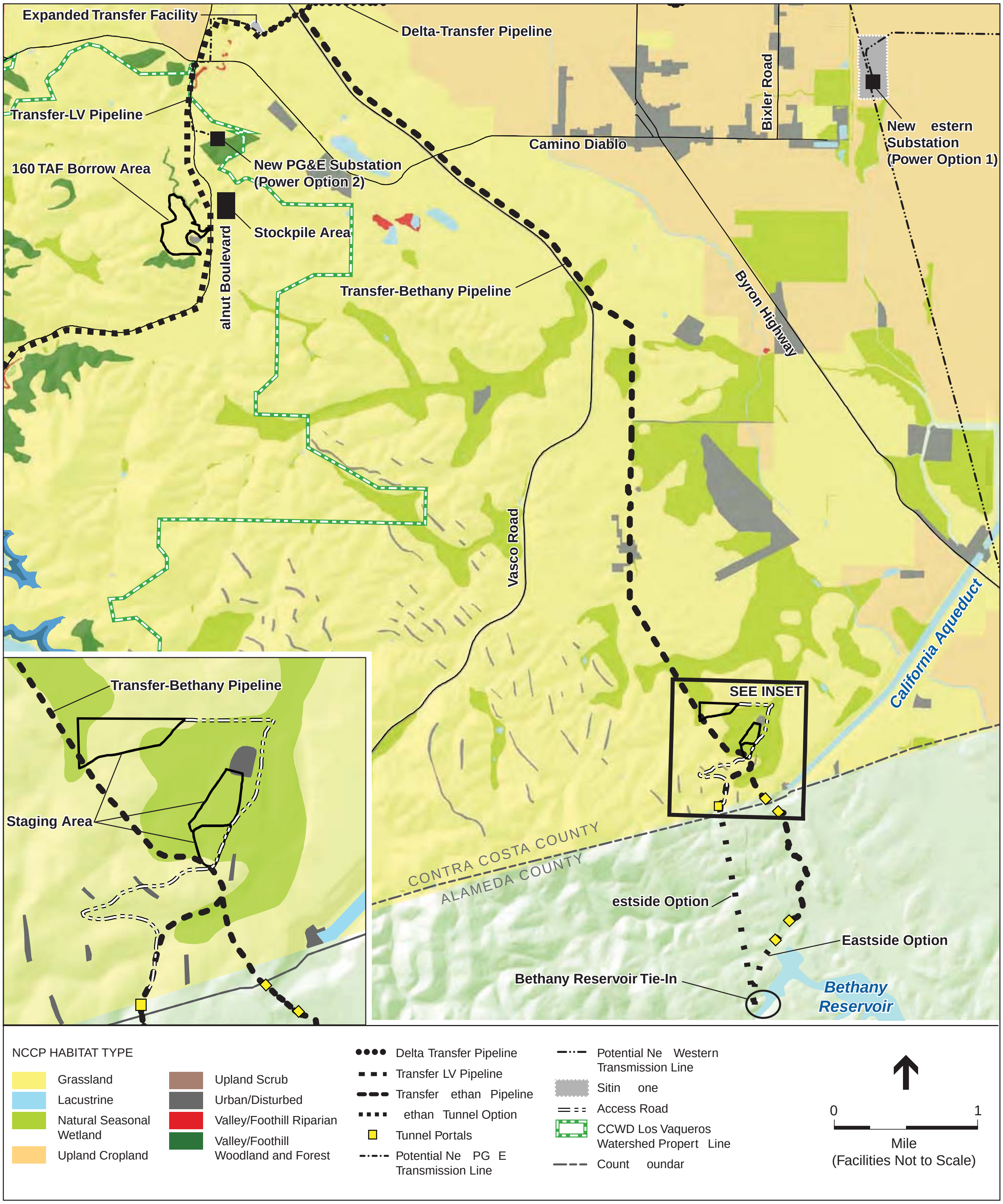
Special-Status Species

A comprehensive list of special-status plant and wildlife species in the project region was compiled to assess the likelihood of species occurrence and potential project impacts to these species. Sources used in preparing this list include the California Natural Diversity Data Base (CNDDB) (CDFG, 2008), ongoing consultation with CDFG and USFWS, CNPS' literature and an electronic database, scoping letters, biological literature of the region, ongoing CCWD wetland and wildlife monitoring programs, and focused field surveys (see **Table 4.6-3** for survey dates and findings).

The regional species list includes 54 special-status plants and 38 special-status wildlife species with the potential to occur in the regional project vicinity (see Appendix D, Table D-1). For each project component, each species' habitat requirements were compared to available habitats in the study area. This review of habitat requirements, focused botanical and wildlife survey findings, and database records identified 7 special-status plant species and 36 special-status wildlife species that could potentially occur or are known to occur in study areas that could be affected by the project. These species are presented in **Table 4.6-4**.

Several species were eliminated from further consideration because typical habitat required by the species does not occur in the project area, and/or focused surveys provided further evidence that it would be unlikely for the species to occur in the area of potential project impact (e.g., big tarplant [*Blepharizonia plumosa*], caper-fruited tropidocarpum [*Tropidocarpum capparideum*], diamond-petaled California poppy [*Eschscholzia rhombipetala*], rayless ragwort [*Senecio aphanactis*] and recurved larkspur [*Delphinium recurvatum*]). See Appendix D for the complete list of special-status species considered and information about species eliminated from further consideration.

2 The study area is defined as a 500-foot-wide corridor for pipelines and a 150-foot-wide area around the perimeter of facilities.



SOURCE: USGS, 1993; and ESA, 2008

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Figure 4.6-5
Distribution of NCCP Habitats alon the
Transfer LV and Transfer ethan Pipelines

TABLE 4.6-3
SURVEY DATES FOR SPECIAL-STATUS PLANTS

Project Component	Survey Dates	Findings	Pending Surveys
Reservoir Inundation Footprint and Dam and other In-Watershed Facilities[1]	June 3, 4, 10, 11, 14, and 15, 2004; March 21, April 11-14, April 27-29, May 11 and 31, June 2, June 8-9, 21-23, August 17-18, October 25, 2005; May 22, 2007; April 18, 2008	San Joaquin spearscale: present in watershed outside project area Brewer's dwarf-flax: Portions of one population occur in the reservoir inundation footprint; absent from other project facilities	None
Delta Intakes and Transfer Station	May 22, 2007; April 23, 2008	Rose-mallow: populations occur outside the Expanded Old River Intake project area 1,400 feet to the north, 1,100 feet to the south, and 600 feet away across Old River. A colony consisting of fewer than 15 plants occurs at the site for the new Delta Intake and Pump Station Mason's lilaeopsis: Populations occur 5,000 feet north and 1,200 feet south of Expanded Old River Intake and Pump Station; greater than 700 feet from the new Delta Intake and Pump Station site.	None
Delta-Transfer Pipeline	May 22, 2007	Negative for rare plants	None
Transfer-LV Pipeline	March 21, April 11-14, April 27-29, May 11 and 31, June 2, June 8-9, 21-23, August 17-18, October 25, 2005; May 22, 2007; April 18, 2008	Negative for rare plants	None
Transfer-Bethany Pipeline	April 15, 17, and 18, 2008	San Joaquin spearscale: present in portions of alignment	Limited follow-up surveys for heartscale and brittlescale at a few distinct locations
Power Option 1	April 22 and 23, 2008	San Joaquin spearscale present in Power Option 1 Western substation siting zone–facilities will be sited to avoid plants	Limited follow-up surveys for heartscale and brittlescale at a few distinct locations
Power Option 2	April 22 and 23, 2008	San Joaquin spearscale present in Western powerline alignment and would be spanned by powerlines	Limited follow-up surveys for heartscale and brittlescale at a few distinct locations
160-TAF Borrow Area (Alternative 4)[2]	April 23, 2008; August 5, 2008	Negative for rare plants	None

1 Other in-watershed facilities under Alternatives 1, 2, and 3 include the Marina Complex, marina access road, borrow area, picnic areas, trailhead parking, westside access road, eastside trail, stockpile area, and parking areas. Facilities under Alternative 4 include similar facilities and the 160-TAF borrow area.
2 TAF = thousand acre-foot

SOURCE: ESA, 2004; 2007b; 2008

TABLE 4.6-4
SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name **Common Name**	**Listing Status USFWS/CDFG/ CNPS/ CALFED[3]**	**General Habitat**	**Potential for Species Occurrence in the Project Area**	**Period of Identification or Blooming Period**	**NCCP Habitat Associations**
Invertebrates					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES					
Branchinecta longiantenna Longhorn fairy shrimp	FE/--/--/m	Rock outcrop pools or other areas capable of ponding water seasonally	Absent. No longhorn fairy shrimp habitat or local occurrences occur within 500 feet of project facilities. This species would not be affected by project activities.	Year-round (eggs in dry season, adult shrimp in winter)	NSW (Rock outcrop pools)
Branchinecta lynchi Vernal pool fairy shrimp	FT/--/--/m	Vernal pools or other areas capable of ponding water seasonally	Present. Occupied and potential habitat Identified in the Transfer-Bethany Pipeline alignment; possibly in a single pool on the Delta-Transfer Pipeline (ESA, 2008a). In-watershed occurrences are outside the project area.	Year-round (eggs in dry season, adult shrimp in winter)	NSW
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT/--/--/R	Riparian habitat, levee and riprap lined stream banks containing its host plant, elderberry shrubs (*Sambucus* spp.)	Present (in-watershed). Elderberry shrubs in the watershed show larval exit holes. Elderberry shrubs are not otherwise present in the project area.	Year round, emergence March-June	VFR, Gr, US, VFW, UC
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN					
Branchinecta mesovallensis Midvalley fairy shrimp	--/--/--/m	Vernal pools or other areas capable of ponding water seasonally	Low-Moderate. Low likelihood of occurrence in created pools on the Transfer-Bethany Pipeline.	Year-round (eggs in dry season, adult shrimp in winter)	NSW
Hygrotus curvipes Curved-foot hygrotus diving beetle	FSC/--/--/--	Drainages, seeps, and wet areas; standing water in ponds or ephemeral pools	Present. Present in stock ponds and drainages in the watershed and likely in intermittent drainages and swales on pipeline routes.	Spring months	NSW
Amphibians					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES					
Ambystoma californiense California tiger salamander	FT/CSC/--/m	Wintering sites occur in grasslands occupied by burrowing mammals; breed in ponds and vernal pools	Present. Four breeding sites in the watershed study area; uplands throughout watershed provide aestivation habitat; upland habitat present on the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline.	Winter rains and March-April	NFE, NSW, VFR, Gr, VFW

[3] Status codes defined at end of chart.

TABLE 4.6-4 (Continued)
SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name Common Name	Listing Status USFWS/CDFG/ CNPS/CALFED	General Habitat	Potential for Species Occurrence in the Project Area	Period of Identification or Blooming Period	NCCP Habitat Associations
Amphibians (cont.)					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES (cont.)					
Rana draytonii California red-legged frog	FT/CSC/--/m	Breed in stock ponds, pools, and slow-moving streams	Present. Eleven breeding sites in the watershed study area, with more potential breeding habitat. Frogs may be encountered in upland habitat on the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline.	Year-round	NFE, VFR, Gr, VFW
Reptiles					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES					
Masticophis laterals euryxanthus Alameda whipsnake (= Alameda striped racer)	FT/ST/--/m	Coastal ranges, in chaparral and riparian habitat and adjacent grasslands.	Present. Occupied scrub habitat present in the watershed study area. Snakes are expected to use grasslands, woodlands, and other nonscrub habitat in the watershed.	March-November	VFR, Gr, US, VFW
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN					
Actinemys marmorata Western pond turtle	--/CSC/--/m	Lakes, ponds, reservoirs, and slow-moving streams and rivers, primarily in foothills and lowlands	Present. Present in stock ponds and drainages in the watershed and likely in intermittent drainages and swales on pipeline routes.	Year-round	La, NFE, VFR, Gr, US, VFW
Masticophis flagellum ruddocki San Joaquin whipsnake (= coachwhip)	--/CSC/--/m	Open grassland, pasture, and alkali scrub	Present. Presumed present in grasslands in the watershed, on pipeline routes, and at the Expanded Transfer Facility.	March-October	Gr, US, VFW
Phrynosoma coronatum Coast horned lizard	--/CSC/--/--	Valley woodland, coniferous forest, riparian, and grassland habitats; most commonly in sandy washes with scattered shrubs	High. Suitable habitat may be present on the Transfer-Bethany Pipeline, south of Armstrong Road, and parts of the Power Option 2 Western powerline alignment.	Year-round	VFR, US, VFW
Birds					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES					
Buteo swainsoni Swainson's hawk	--/ST/--	Nests in large trees, often near water, open grasslands, or agricultural lands	Moderate. Historic nesting site noted at one location, 300 feet from the Delta-Transfer Pipeline; low likelihood of nesting on other pipeline alignments or in the watershed	March-July	VFR, Gr, UC, VFW, NSW, US
Haliaeetus leucocephalus Bald eagle	BEPA-FD/SE-CFP/--/m	Winter foraging at lakes and along major rivers	Low (nesting). The watershed supports active wintering and foraging habitat, but no active nesting	Year-round	La, NFE, VFR, VFW

TABLE 4.6-4 (Continued)
SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name Common Name	Listing Status USFWS/CDFG/ CNPS/CALFED	General Habitat	Potential for Species Occurrence in the Project Area	Period of Identification or Blooming Period	NCCP Habitat Associations
Birds (cont.)					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES (cont.)					
Accipiter cooperi Cooper's hawk	--/CSC/--/m	Nests in dense oak and riparian woodland	High. Expected to nest in wooded portions of the watershed and on the Transfer-LV Pipeline and Transfer-Bethany Pipeline.	Year-round	VFR, VFW
Accipiter striatus Sharp-shinned hawk	--/CSC/--/--	Nests in dense stands of conifers and riparian habitats	High. Expected to nest in wooded portions of the watershed and on the Transfer-LV Pipeline and Transfer-Bethany Pipeline.	Year-round	VFR, VFW
Agelaius tricolor Tricolored blackbird	--/CSC/--/m	Nests in freshwater marshes with dense stands of cattails or bulrushes, occasionally in willows, thistles, mustard, blackberry brambles, and dense shrubs and grains	Moderate. Nesting sites available at disjunctive locations in the watershed and on pipeline routes.	Year-round; spring (nesting)	NFE, VFR, Gr, UC
Aquila chrysaetos Golden eagle	BEPA/CSC-CFP/--/m	Nests in canyons and large trees in open habitats	Present. Six nesting occurrences reported from the watershed; one in the study area. Potential to occur on Transfer-LV Pipeline	Year-round	Gr, US, VFW
Athene cunicularia hypugea Western burrowing owl	--/CSC/--/m	Nests and forages in low-growing grasslands with burrowing mammals	High. Nesting habitat present in grasslands in the watershed, on the fringes of agricultural lands and in grasslands on the Delta-Transfer Pipeline, Transfer-LV Pipeline, Transfer-Bethany Pipeline, and at the Expanded Transfer Facility.	Year-round	Gr, UC
Asio flammeus Short-eared owl	--/CSC/--/--	Inhabits open fields, meadows, and marshes	High. Nesting habitat present in grasslands in the watershed and on the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline.	Year-round	Gr, UC
Circus cyaneus Northern harrier	--/CSC/--/m	Ground nester found in grasslands and in adjacent wetlands or upland/wetland areas	Moderate. Though nests have not been identified, low likelihood of nesting near marshland habitat in the watershed; may nest in open grasslands on pipeline routes and at Expanded Transfer Facility.	Year-round	NFE, NSW, Gr, UC
Elanus leucurus White-tailed (= black shouldered) kite	--/CFP/--/m	Nests in shrubs and trees next to grasslands, forages over grasslands and agricultural lands	High. Nesting habitat available in watershed. May nest in the few wooded areas in and near the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline.	Year-round	VFR, Gr, UC
Eremophila alpestris actica California horned lark	--/CSC/--/--	Nests and forages in short-grass prairie, mountain meadow, coastal plain, fallow fields, and alkali flats	High. May nest in short annual grasslands in the watershed and on all pipeline segments.	Year-round	Gr, UC

TABLE 4.6-4 (Continued)
SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name Common Name	Listing Status USFWS/CDFG/ CNPS/CALFED	General Habitat	Potential for Species Occurrence in the Project Area	Period of Identification or Blooming Period	NCCP Habitat Associations
Birds (cont.)					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES (cont.)					
Falco mexicanus Prairie falcon	--/CSC/--/--	Inhabits hills, canyons, and mountainous areas with grasslands; nests on cliffs or abandoned raptor nests	Low. Nesting not expected in study area	March-August	Gr, US
Lanius ludovicianus Loggerhead shrike	--/CSC/--/--	Scrub, open woodlands, and grasslands	Moderate. May nest in brush and scrub in the watershed and on all pipeline segments.	Year-round	VFR, Gr, US, VFW
Pandion haliatus Osprey	--/CSC/--/--	Large bodies of water that produce fish and are surrounded by forested habitats	High. Nesting may occur in watershed. Less likely elsewhere in project area.	Year-round	VFR, Gr, UC
Mammals					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES					
Vulpes macrotis mutica San Joaquin kit fox	FE/ST/--/m	Annual grasslands or grassy open areas with shrubs, loose-textured soils for burrows and prey base	Presumed present. High quality habitat is present in the watershed and portions of each pipeline alignment; Low to moderate quality habitat is present at the Delta Intake Facilities and Expanded Transfer Facility.	Year-round	Gr, US, VFW
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN					
Antrozous pallidus Pallid Bat	--/CSC/--/--	Roosts in buildings, caves, or cracks in rocks	Low-Moderate. Habitat may be available in large trees in the watershed study area, but large rock crevices are generally lacking.	February-August	La, VFR, Gr, US, VFW
Corynorhinus townsendii Townsend's big-eared bat	--/CSC/--/--	Oak and coniferous woodland and arid grasslands. Roosts in caves, buildings, etc.	Low. Habitat may be available in large trees in the watershed study area, but large rock crevices are generally lacking.	April-October	La, VFR, Gr, US, VFW
Eumops perotis californicus Greater western mastiff bat	FSC/CSC/--/--	Breeds in rugged, rocky canyons and forages in a variety of habitats	Low. Habitat may be available in large trees in the watershed study area, but large rock crevices are generally lacking.	February-August	La, VFR, Gr, US, VFW
Myotis ciliolabrum Small-footed myotis bat	FSC/--/--/--	Forages over grasslands and roosts in caves and rock crevices	Low. Habitat may be available in large trees in the watershed study area, but large rock crevices are generally lacking.	February-August	La, VFR, Gr, US, VFW
Myotis evotis Long-eared myotis bat	FSC/--/--/--	Inhabits woodlands and forests up to an approximately 8,200-foot elevation; generally not in Central Valley.	Low. Habitat may be available in large trees and rocks in the watershed study area, but large rock crevices are generally lacking.	February-August	La, VFR, Gr, US, VFW

TABLE 4.6-4 (Continued)
SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name Common Name	Listing Status USFWS/CDFG/ CNPS/CALFED	General Habitat	Potential for Species Occurrence in the Project Area	Period of Identification or Blooming Period	NCCP Habitat Associations
Mammals (cont.)					
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN (cont.)					
Myotis thysanodes Fringed myotis bat	FSC/--/--/--	Inhabits a variety of habitats including pinyon-juniper woodland, valley-foothill hardwood, hardwood-conifer forests, and desert scrub; generally not in Central Valley	Low. Rock crevice habitat is generally lacking in the watershed study area.	February-August	La, VFR, Gr, US, VFW
Myotis volans Long-legged myotis bat	FSC/--/--/--	Inhabits forests and woodland habitats, primarily oak and juniper woodlands	Low. Habitat may be available in large trees in the watershed study area, but large rock crevices are generally lacking.	February-August	La, VFR, Gr, US, VFW
Myotis yumanensis Yuma myotis bat	FSC/CSC/--/--	Open forests and woodlands below 8,000-foot elevation in close association with water bodies	Low. Rock crevice habitat is generally lacking in the watershed study area.	February-August	La, VFR, Gr, US, VFW
Perognathus inornatus inornatus San Joaquin pocket mouse	--/CSC/--/--	Annual grasslands, saltbush scrub, and oak savannah habitats; usually found in areas with friable soils	Moderate. Bush seepweed (iodine bush) habitat on the Western alignment and grasslands with friable soils on the Transfer-Bethany Pipeline and at the Western substation site provide the best available habitat. Non-native annual grasslands throughout the project area provide potential, though lesser quality habitat.	Year-round	Gr
Taxidea taxus American badger	--/CSC/--/--	Dry, open grasslands	Present. High quality habitat is present in the watershed and portions of each pipeline alignment; low to moderate quality habitat is present at the Delta Intake Facilities and Expanded Transfer Facility.	Year-round	Gr
Plants					
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES					
Lasthenia conjugens Contra Costa goldfields	FE/--/1B/m	Vernal pools and seasonal wetlands in grassland and woodland	Absent based on focused botanical survey findings. Transfer-Bethany Pipeline traverses critical habitat for this species.	March-June	NSW
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN					
Atriplex cordulata Heartscale	--/--/1B/--	Chenopod scrub and sandy, alkaline grasslands	Low-Moderate potential at a few distinct sites on the Transfer-Bethany Pipeline alignment; final survey delayed by site access.	April-October	NSW, Gr

TABLE 4.6-4 (Continued)
SPECIAL-STATUS SPECIES KNOWN TO OCCUR OR WITH POTENTIAL TO BE AFFECTED BY THE PROJECT

Scientific Name Common Name	Listing Status USFWS/CDFG/ CNPS/CALFED	General Habitat	Potential for Species Occurrence in the Project Area	Period of Identification or Blooming Period	NCCP Habitat Associations
Plants (cont.)					
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN (cont.)					
Atriplex depressa Brittlescale	--/--/1B/m	Alkaline or clay grasslands, chenopod scrub, and playas; occasionally in riparian areas, marshes, or vernal pools	Present in LV watershed. Moderate potential at a few distinct sites on the Transfer-Bethany Pipeline alignment; final survey delayed by site access.	May-October	NSW, Gr
Atriplex joaquiniana San Joaquin spearscale	--/--/1B/m	Alkaline seasonal wetlands and sinks in grasslands, chenopod scrub, and alkali meadows	Present outside staging area in the watershed, on portions of the Transfer-Bethany Pipeline alignment, Power Option 1 (i.e., new substation siting zone); and spanned by powerlines under Power Option 2.	April-October	NSW, Gr
Hesperolinon breweri Brewer's dwarf-flax (=western flax)	--/--/1B/m	Transition between annual grassland and mixed chaparral; also near woodlands	Present. Portions of one population occur in the watershed study area; absent from other project facilities.	May-July	Gr, US, VFW
Hibiscus lasiocarpus Rose-mallow	--/--/2/m	Tidally influenced coastal and freshwater marsh	Present (New Intake). A population occurs at the site for the new Delta Intake and Pump Station	June-September	NFE
Lilaeopsis masonii Mason's lilaeopsis	--/SR/1B	Tidally influenced coastal and freshwater marsh	Present (off site). Near Delta Intake Facilities, 5,000 feet north and 1,200 feet south of Expanded Old River Intake and Pump Station, greater than 700 feet from the new Delta Intake and Pump Station site	April-November	TFE

STATUS CODES:

Federal (U.S. Fish and Wildlife Service):
BEPA = Bald Eagle Protection Act
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FSC = Former Federal Species of Special Concern (list is no longer maintained)
FD = Federal Delisted Species
FC = Candidate for Federal listing
State (California Department of Fish and Game):
SE = Listed as Endangered by the State of California
ST = Listed as Threatened by the State of California
SR = Listed as Rare by the State of California (plants only)
CSC = California species of special concern
CFP = California fully protected species
California Native Plant Society : List 1A = Plants believed extinct; List 1B= Plants rare, threatened, or endangered in California and elsewhere; List 2= Plants rare, threatened, or endangered in California but more common elsewhere; List 3=Plants about which more information is needed; List 4 = Plants of limited distribution

SOURCES: CNPS, 2008; CDFG, 2008; ESA, 2008a ; ESA, 2008b

CALFED: (CALFED Bay-Delta Program Multi-Species Conservation Strategy [MSCS] Species Goals)
R = Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long term survival in nature.
r = Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
m = Maintain. Ensure that any adverse effects on the species that could be tied to implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.
Natural Community Conservation Plan Habitat Type
Gr = Grassland
La = Lacustrine
NFE = Nontidal Freshwater Emergent
NSW = Natural Seasonal Wetland
SE = Saline Emergent
TFE = Tidal Freshwater Emergent
UC = Upland Cropland
US = Upland Scrub
VFR = Valley/Foothill Riparian
VFW = Valley/Foothill Woodland Forest

The following data sources advised the analysis:

- The CNDDB for plants, wildlife, and plant communities, including species occurrence data and Geographic Information System (GIS) map coverage (CDFG, 2008), and review of available data in the CNDDB files associated with discussion with CNDDB staff
- CALFED documents including the Ecosystem Restoration Plan Program, NCCP prepared by California resources agencies, including CDFG, and the MSCS (CALFED, 2000) prepared by federal resource agencies, including USFWS and NMFS
- Environmental regulatory documents (Stage II EIS/EIR, BOs), technical reports, state and federal regulatory permits, and mitigation plans prepared for the existing Los Vaqueros Reservoir project
- East County HCP/NCCP documents and in-house GIS data
- Mt. Diablo State Park HCP draft documents
- San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, including maps
- Coordination with CCWD watershed biologists
- USFWS Endangered Species Program staff, Fish and Wildlife Coordination Act staff, and Endangered Species Recovery Program staff
- Focused botanical and wildlife surveys of the 160-TAF borrow area, Transfer-Bethany Pipeline, Delta intake facility, Power Option 1 and 2 (i.e., new substation siting zone, PG&E substation and powerline alignments) by ESA biologists in 2008 (ESA, 2008b)
- Large branchiopod surveys within the watershed and along project pipeline alignments (ESA, 2008a)
- Focused botanical and wildlife surveys of the Delta-Transfer Pipeline, Transfer-LV Pipeline, Expanded Transfer Facility site, and Transfer-Bethany Pipeline in 2007 (ESA, 2007)
- Focused botanical surveys in the Los Vaqueros Watershed conducted in 2005 and 2006 that characterized the 500-TAF inundation level, which is no longer being considered as an option under the project, plus a 1,000 foot buffer. This survey area was large enough to adequately characterize the potential for all proposed recreational facilities in the Los Vaqueros Watershed to support special status plants.
- CDFG regional staff, CALFED staff, and state species experts

Comprehensive protocol-level special-status plant surveys have been completed for nearly all project facilities. After comprehensive botanical surveys in spring 2008 that analyzed all out-of-watershed facilities, a limited number of discrete sites in the Transfer-Bethany Pipeline alignment and Power Option 1 (i.e., within new Western substation siting zone) were identified that provide habitat for non-listed late-blooming *Atriplex* species, specifically brittlescale and heartscale, and require follow-up surveys, as identified in Tables 4.6-3 and 4.6-4.

The special-status plant and wildlife species identified in Table 4.6-4 are more fully described in the species accounts provided below. The following special status plant species occur in the local project area, but are absent from the project study area based on focused botanical survey findings. The regional distribution of these species is presented in maps used in this section, but because they are absent from the study area, or surveys identified that impacts would not occur, they are not further described in this section. See Appendix D for descriptions of these species.

- Mt. Diablo manzanita (*Arctostaphylos auriculata*)
- Contra Costa manzanita (*Arctostaphylos manzanita* ssp. *laevigata*)
- Alkali milk-vetch (*Astragalus tener* var. *tener*)
- Big tarplant (*Blepharizonia plumosa*)
- Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*)
- Recurved larkspur (*Delphinium recurvatum*)
- Round-leaved filaree (*Erodium macrophyllum*)
- Diamond-petaled California poppy (*Eschscholzia rhombipetala*)
- Diablo helianthella (*Helianthella castanea*)
- Rayless ragwort (*Senecio aphanactis*)
- Caper-fruit tropidocarpum (*Tropidocarpum capparideum*)
- Mt. Diablo fairy lantern (*Calochortus pulchellus*)

A brief description of those special-status plant and wildlife species that have been identified, or are expected to occur in the project area based on local sightings and/or available habitat (but that may not necessarily be impacted by the project), is provided below.

Invertebrates

Federal or State Threatened and Endangered Species

Longhorn fairy shrimp (*Branchinecta longiantenna*). Longhorn fairy shrimp are described from several vernal pool habitat types in California, ranging from small, clear, sandstone outcrop pools to large, turbid, alkaline, grassland pools; however, in Alameda and Contra Costa Counties this species is only described from a small series of sandstone outcrop pools.

Two local longhorn fairy shrimp records were identified in the East County HCP/NCCP: Souza Ranch and Vasco Caves Regional Preserve. Both of these locations are shallow sandstone-rock-outcrop vernal pools within non-native grasslands (East County HCPA, 2006).

Potential low-quality habitat for this species may be present in 16 vernal pools on the Transfer-Bethany Pipeline alignment in the project study area, which includes the Los Vaqueros Reservoir Expansion, Delta Intake Facilities, Conveyance Facilities, Recreation Facilities, and Power Supply Infrastructure (ESA, 2008a). Of these, pools with the highest quality were observed to support vernal pool fairy shrimp (*Branchinecta lynchi*), which rarely co-occur with longhorn fairy shrimp (USFWS, 2005a). Because longhorn fairy shrimp are locally restricted to rock outcrop pools, and because this habitat is absent from the study area, this species is not expected in the project area.

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*). Vernal pool fairy shrimp occur in a variety of vernal pool habitats, ranging from small, clear, sandstone rock pools to large, turbid, alkaline, grassland valley floor pools. Although the species has been collected from large vernal pools, it tends to occur in smaller ones. Most commonly they occur in grass- or mud-bottomed swales, or basalt flow depression pools in unplowed grasslands (USFWS, 2005a).

Two vernal pool fairy shrimp occurrences are documented in the Los Vaqueros Watershed (CDFG, 2008; ESA, 2008a), both outside the Reservoir Expansion and Recreation Facilities study areas. Before construction of Los Vaqueros Reservoir, Jones and Stokes (1990) found vernal pool fairy shrimp in a rock outcrop vernal pool roughly 0.20 mile east and upslope from the inundation boundary (**Figure 4.6-6**). Habitat for vernal pool fairy shrimp at the Vasco Caves vernal pool complex is 0.90 mile east of the inundation boundary (Figure 4.6-6).

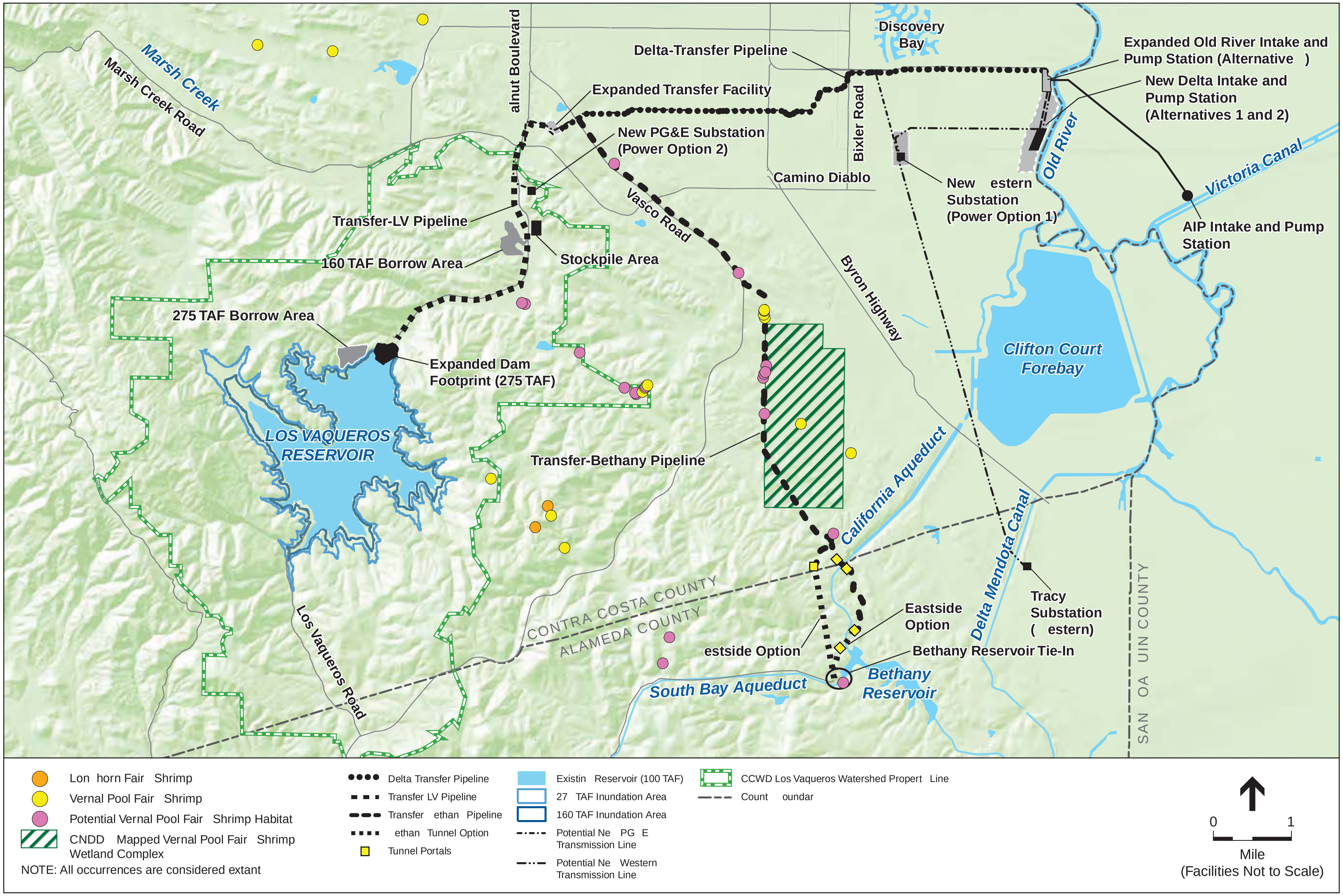
Potential habitat for vernal pool fairy shrimp is present in a single swale on the Delta-Transfer Pipeline. During dip netting surveys in 2008, this species was identified in 4 vernal pools in the Transfer-Bethany Pipeline alignment, with another 12 pools deemed to provide suitable habitat (ESA, 2008a). To the degree possible, habitat for branchiopods was characterized beyond the 500-foot pipeline study area boundaries. An extant population occurs in the local vicinity of Byron Airport within vernal pool fairy shrimp Critical Habitat Unit 19B (CDFG, 2008; USFWS, 2006).

During biological surveys in spring 2008, high-quality vernal pool habitat was noted in multiple pools in the Western powerline alignment, just north of Reclamation’s Skinner Delta Fish Protective Facility. This area would be spanned under Power Option 2 (with no activities in this area under Power Option 1). Habitat is absent from the new Western substation siting zone associated with Power Option 1 and the PG&E facilities associated with Power Option 2.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*). Valley elderberry longhorn beetles are unique insects that spend most of their lives within the stems of elderberry (*Sambucus* spp.) trees and shrubs. Often, the only indicators of their presence are the distinctive small oval openings that are left after larvae pupate and emerge (UC Berkeley, 2005; USFWS, 1999c). Valley elderberry longhorn beetles use elderberry shrubs with a stem diameter of at least 1-inch (at ground level) as a host plant (USFWS, 1999c). Elderberry shrubs typically grow in association with other riparian species, but they also occur as isolated shrubs in upland areas (UC Berkeley, 2005).

The nearest documented valley elderberry longhorn beetle to the inundation boundary is about 17 miles east of the existing dam (CDFG, 2008). The Los Vaqueros Watershed is on the westernmost fringe of this species’ range, as valley elderberry longhorn beetles are not described from the inner or outer Coast Ranges. The geographic dividing line between the valley elderberry longhorn beetle and coastal longhorn beetle subspecies is not well defined.

Valley elderberry longhorn beetle activity was found in several portions of the proposed inundation area and in the Inlet/Outlet Pipelines study area. The 275-TAF inundation zone supports 45 elderberry shrubs (six with six beetle exit holes) with two additional shrubs within 100 feet of



SOURCE: USGS, 1993 (base map); ones Sto es Associates, 1992; and ESA, 2007

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Figure 4.6-6
Listed Vernal Pool ranchiopod Locations in
Project Stud Area

the inundation zone (ESA, 2005). The Inlet/Outlet Pipelines study area supports 10 elderberry shrubs with no identified exit holes (ESA, 2005).

Elderberry shrubs do not occur near the Delta Intake Facilities, Conveyance Facilities (except in the Inlet/Outlet Pipelines construction area), Recreation Facilities, or Power Options 1 and 2.

Federal or State Species of Special Concern

Midvalley Fairy Shrimp (*Branchinecta mesovallensis*). Midvalley fairy shrimp occur in small, shallow, short-lived vernal pools, vernal swales, and artificial ephemeral wetland habitats. They are found in Sacramento, Solano, Yolo, Contra Costa, San Joaquin, Madera, Merced, and Fresno Counties. Of 65 reported occurrences, the three records from Contra Costa County occur about 5.5 miles northeast, 5.5 miles east, and 3.8 miles east of the inundation boundary (CDFG, 2008). Midvalley fairy shrimp populations have not been found the Los Vaqueros Reservoir vicinity. Based on its known range, this species is considered unlikely in the Los Vaqueros Watershed.

Habitat for this species does not occur in the study areas for the Delta Intake Facilities, Power Options 1 and 2, or Expanded Transfer Facility. For Conveyance Facilities, potential habitat was identified in 16 vernal pools on the Transfer-Bethany Pipeline and a single swale on the Delta-Transfer Pipeline. This species was not detected during branchiopod surveys (ESA, 2008a). Midvalley fairy shrimp have not been documented in the vernal pool complex near Byron Airport. Though potentially suitable habitat is available in limited locations, the likelihood of encountering midvalley fairy shrimp in the project area is considered low.

Curved-foot Hygrotus Diving Beetle (*Hygrotus curvipes*). Hygrotus beetles are predatory diving beetles in both their adult and larval stages that feed on small aquatic invertebrates (Borror and White, 1970). They occur in stock ponds, irrigation channels, roadside drainages, slow-moving creeks, ponds, and alkali pools.

CDFG (2008) documents 21 extant occurrences of Hygrotus beetles in Contra Costa and Alameda Counties. This aquatic insect occurs in several wetland sites and stock ponds within the Los Vaqueros Watershed, favoring alkaline vernal pools and drying portions of creeks (Hafernik, 1988). In a 1988 survey, individuals were found in stock ponds throughout the Los Vaqueros Watershed, though not in flowing portions of creeks (Hafernik, 1988).

Diving beetle habitat does not occur near the Delta Intake Facilities or Expanded Transfer Facility. Suitable habitat is present in 16 alkali and vernal pools identified in the Transfer-Bethany Pipeline alignment (ESA, 2008a), but not in other pipeline corridors. For Power Supply Option 2, a handful of alkali pools north of the Skinner Delta Fish Protective Facility that provide potential diving beetle habitat would be spanned by powerlines. Habitat is absent from the Western substation site and PG&E facility sites.

Amphibians

Federal or State Threatened and Endangered Species

California Tiger Salamander (*Ambystoma californiense*). California tiger salamanders are principally an upland species found in annual grasslands and in the grassy understory of valley-foothill hardwood habitats in Central and Northern California. They require underground refuges (usually ground squirrel or other small mammal burrows), where they spend the majority of their annual cycle. Between December and February, when seasonal ponds begin to fill, adult California tiger salamanders engage in mass migrations to aquatic sites during a few rainy nights and are explosive breeders (Barry and Shaffer, 1994).

During drought years when ponds do not form, adults may spend the entire year in upland environments, while juveniles may spend 4 to 5 years in their upland burrows before reaching sexual maturity and breeding for the first time (Petranka, 1998; Trenham et al, 2000). Adult tiger salamanders swiftly disperse after breeding and have been documented to migrate up to 129 meters (423 feet) the first night after leaving a breeding pond (Loredo et al., 1996). Adult California tiger salamanders readily aestivate[4] in grasslands near ponds and at great distances from breeding ponds. Adults are known to travel distances greater than 1 kilometer (0.62 mile) from breeding ponds and have been documented at distances of 2 kilometers (1.2 miles) or more (Orloff, 2007). Typical aestivation sites include the burrows of California ground squirrels and valley pocket gophers (*Thomomys bottae*).

California tiger salamanders occur in the foothill grasslands of the Mt. Diablo Range and throughout the Los Vaqueros Watershed. Seven tiger salamander breeding occurrences are known in the project footprint in the Los Vaqueros Watershed (**Figure 4.6-7**). California tiger salamanders are expected to use grassland and woodland habitat throughout the Los Vaqueros Watershed, including the PG&E substation site under Power Option 2, for aestivation, foraging, and dispersal.

California tiger salamander habitat is not present at the Delta Intake Facilities, Western substation facilities under Power Option 1, or Western powerline alignments under Power Options 1 and 2. Upland aestivation habitat is present at the PG&E substation site under Power Option 2.

The Delta-Transfer Pipeline traverses cultivated and agricultural lands and ruderal areas that do not provide aquatic breeding habitat for the California tiger salamander; however, at least four agricultural impoundments in the eastern portion of the alignment provide potential breeding habitat. Of these, two impoundments occur in close proximity to the Expanded Transfer Facility (the closest of these are 0.15 mile north and south of the alignment, just east of the Expanded Transfer Facility) and another is in a walnut orchard 0.75 mile east of the Expanded Transfer Facility. East of the Expanded Transfer Facility, the Delta-Transfer Pipeline alignment traverses grazed annual grasslands for a distance of 1.2 miles before transitioning into agricultural lands further east. Because of the local impoundments, aestivating California tiger salamanders could be encountered in the 1.2-mile stretch extending east from the Expanded Transfer Facility.

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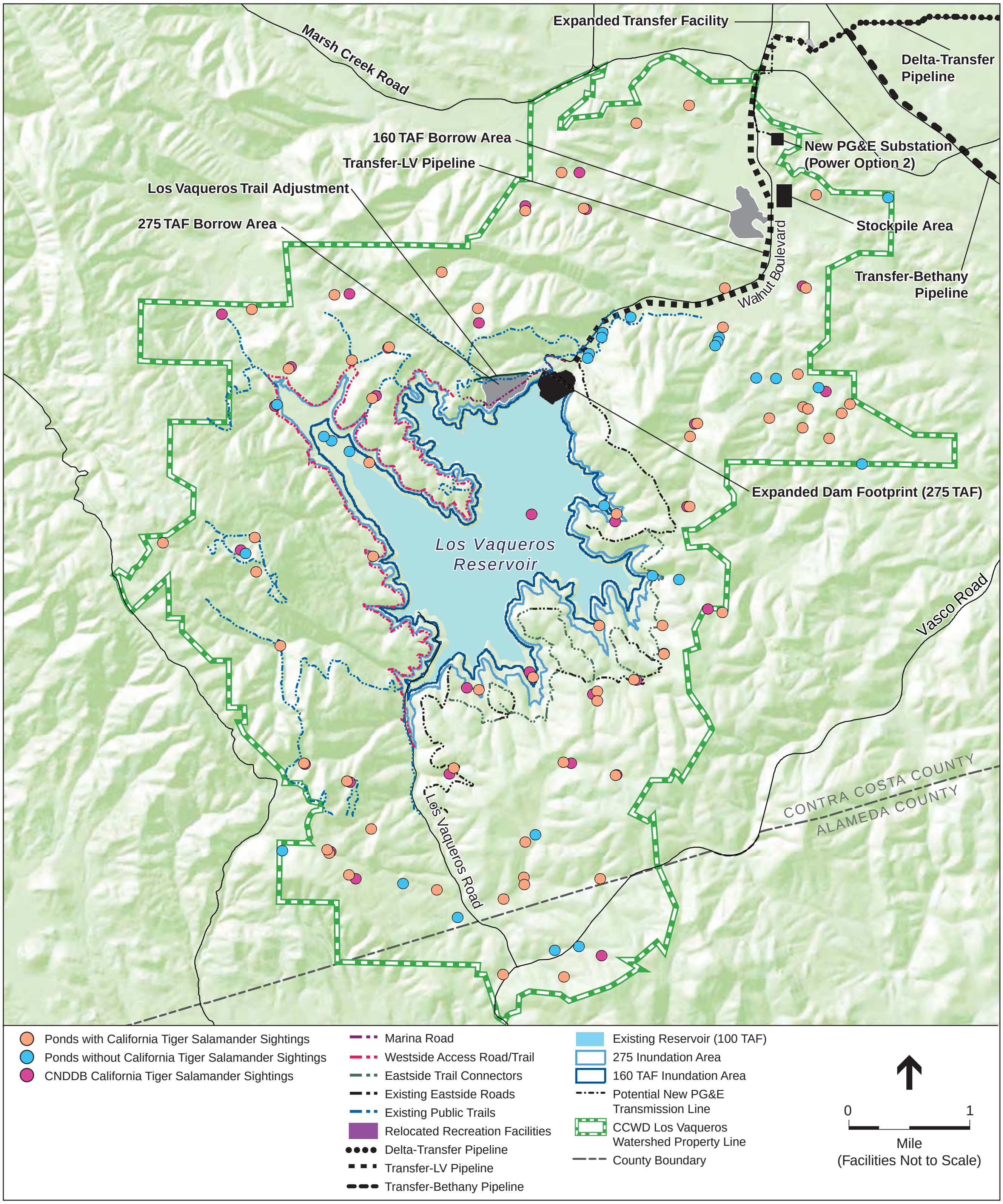
4 Aestivation is a state of dormancy similar to hibernation that occurs during summer and fall.



SOURCE: USGS, 1993 (base map); CNDD , 2007; and ESA, 2008

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Figure 4.6-7
Distribution of California Ti er Salamander Occurrences in the Los Vaqueros Watershed

CDFG (2008) documents California tiger salamander populations in portions of the Transfer-LV Pipeline that parallel Walnut Boulevard in the Los Vaqueros Watershed. Within the watershed, this species is expected in moderate to high densities at all times of the year. Breeding habitat is present in slow-moving portions of Kellogg Creek upstream from Walnut Boulevard, but is not generally present at the two stream crossing locations. Breeding habitat is additionally present in at least five created mitigation ponds below Los Vaqueros Dam. Beyond the study area, potential breeding habitat occurs in at least two and possibly more stock ponds within 0.25 mile of the alignment.

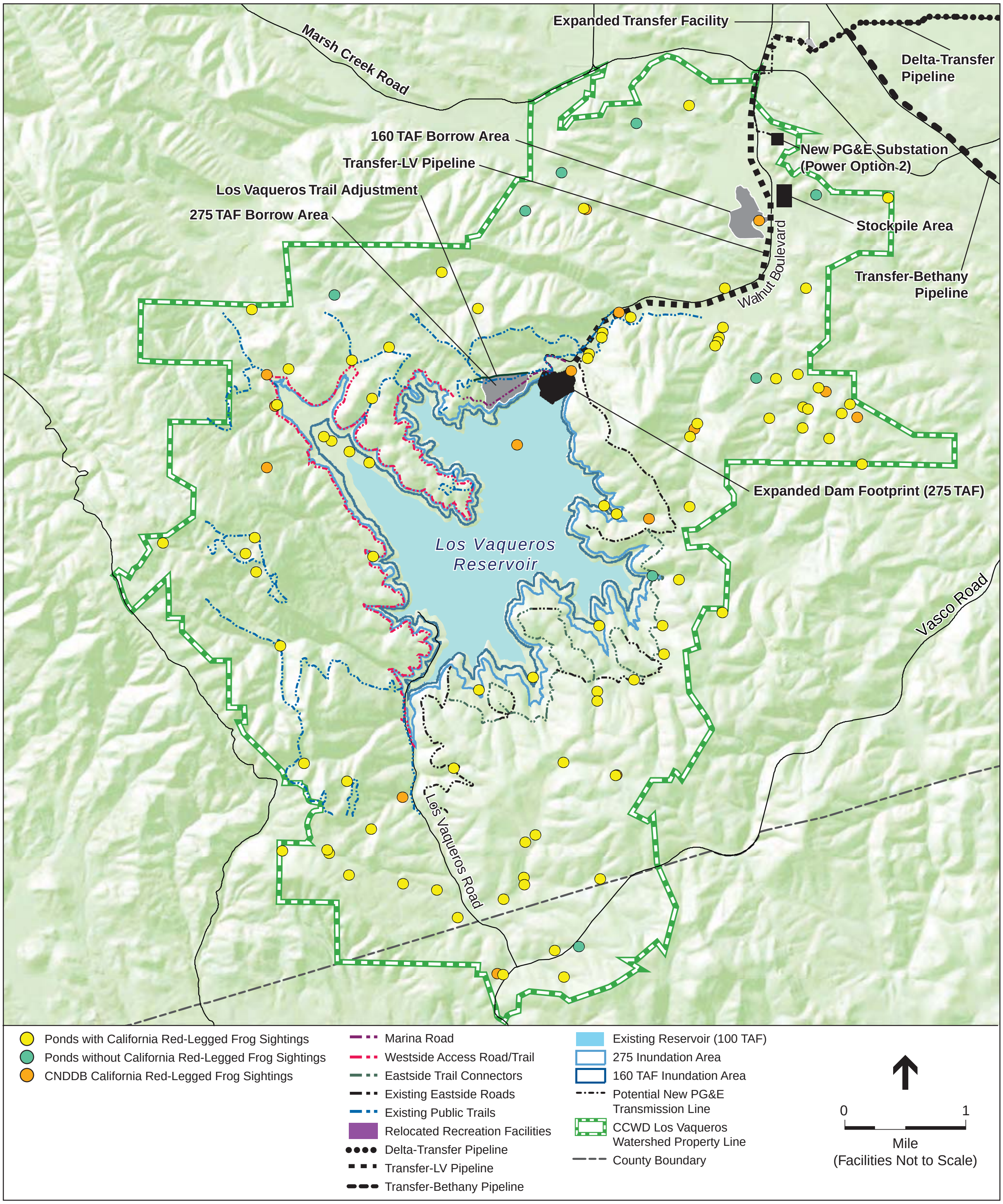
Five California tiger salamander populations are noted within 0.25 mile of the Transfer-Bethany Pipeline (CDFG, 2008), and three additional breeding sites were identified during biological surveys in spring 2008 (B. Pittman, pers. obs.). One known breeding site and four potential breeding sites near Armstrong Road are within the immediate project area. In winter 2008, California tiger salamander larvae were also collected from a roadside ditch on the northern portion of Armstrong Road, but this feature dried before larvae could metamorphose (ESA, 2008a). Most of the Transfer-Bethany Pipeline alignment traverses grasslands that may support this species in some capacity (e.g., aestivation, foraging, or migration). Known and potential California tiger salamander breeding sites are present within 0.5 mile of the alignment along Vasco Road, Armstrong Road, and areas further south (CDFG, 2008).

California tiger salamanders are presumed present in low to moderate densities in undisturbed annual grasslands habitat in the Expanded Transfer Facility study area, though breeding habitat is absent from the Expanded Transfer Facility study area.

California Red-Legged Frog (*Rana draytonii*). California red-legged frogs are largely aquatic frogs found at ponds and slow-moving streams with permanent or semipermanent water. This species opportunistically migrates into upland habitats, due to normal dispersal behavior. This species may aestivate in upland environments when aquatic sites are unavailable or environmental conditions are inhospitable. If water is unavailable, they shelter from dehydration in a variety of refuges, including boulders, downed wood, moist leaf litter, and small mammal burrows.

Historically, the California red-legged frog occurred along the coast from the vicinity of Point Reyes National Seashore, Marin County, and inland from Redding, Shasta County, southward to northwestern Baja California, Mexico (Jennings and Hayes, 1994). The majority of California red-legged frog occurrences in the San Francisco Bay Area are from Contra Costa and Alameda Counties.

California red-legged frogs are documented throughout the Los Vaqueros Watershed. The CNDDB reports 96 California red-legged frog occurrences in and near the watershed with breeding habitat at greater than 11 created wetlands or stock ponds in the Los Vaqueros Reservoir Expansion footprint (CDFG, 2008) (**Figure 4.6-8**). Stock ponds in the watershed support some of the highest densities of California red-legged frog in the region (East County HCPA, 2006). Adult, sub-adult, and juvenile frogs actively disperse through annual grasslands in search of cover and breeding habitat. CCWD actively manages habitat for this species within the watershed, including non-native predator (i.e., American bullfrog, *Lithobates catesbeianus*) exclusion and control.



SOURCE: USGS, 1993 (base map); CNDD , 2007; and ESA, 2007

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Figure 4.6-
Distribution of California Red Le ed Fro
Occurrences in the Los Vaqueros Watershed

The Delta-Transfer Pipeline alignment traverses cultivated and agricultural lands and ruderal areas that do not provide aquatic breeding habitat for the California red-legged frog; however, at least four agricultural impoundments within 1 mile of the alignment, as well as Kellogg Creek, provide potential breeding habitat. Of these, three impoundments occur in close proximity (as close as 0.15 mile) to the Expanded Transfer Facility at the western end of the pipeline alignment. Another impoundment is in a walnut orchard, 0.75 mile east of the Expanded Transfer Facility.

The Delta-Transfer Pipeline parallels within 100 feet a portion of lower Kellogg Creek for about 2.4 miles, which prompted a study of California red-legged frog habitat in this area. Unlike portions of the creek in the Los Vaqueros Watershed, near the Delta-Transfer Pipeline the stream is a fast-flowing, maintained irrigation channel with no backwater areas or off-channel amphibian refugia. Due to its managed condition and rapid, year-round flows, the lower portion of Kellogg Creek does not support California red-legged frog breeding. East of the Expanded Transfer Facility, the alignment traverses grazed annual grasslands for a distance of 1.2 miles before transitioning into agricultural lands further east. Red-legged frogs could be encountered in this area during normal animal movement, but are not expected to inhabit the barren upland portions of the alignment on a sustained basis.

California red-legged frogs can be expected year-round in any aquatic or semiaquatic environments in or near the Transfer-LV Pipeline. These environments include the entirety of Kellogg Creek from the Expanded Transfer Facility to Los Vaqueros Dam, natural and artificial ponds (including the two settling ponds west of the Expanded Transfer Facility), and alkali meadows, seeps, or drainages in the local area. Red-legged frogs are expected to use ephemeral drainages on a seasonal basis during movements, especially after the onset of rain in the fall (Tatarian, 2004). Additionally, adult, sub-adult, and juvenile frogs are expected to migrate intermittently through annual grasslands and other upland habitats.

Breeding habitat is present in slow-moving portions of Kellogg Creek upstream from Walnut Boulevard, but is not generally present at the two crossing locations. Red-legged frog breeding is documented from the five created mitigation ponds just below Los Vaqueros Dam (CCWD, unpublished GIS data). Potential breeding habitat occurs in at least two and possibly more stock ponds within 0.25 mile of the alignment.

At least ten California red-legged frog breeding sites were identified within 0.5 mile of the Transfer-Bethany Pipeline. Occupied sites are documented from both instream impoundments and stock ponds along the alignment. This species generally requires long periods of standing water and is not expected to breed in many of the ephemeral pools along Armstrong Road (but may be otherwise present at these sites). One known breeding site and potential breeding habitat in Brushy Creek are within the Transfer-Bethany Pipeline alignment. Virtually the entire alignment traverses upland habitat that could support this species. Known and potential California red-legged frog breeding sites are present at regular intervals along Vasco Road, Armstrong Road, and areas further south (CDFG, 2008). This species could be encountered during transient migrations through the Expanded Transfer Facility, but is not expected to inhabit the site on a continual basis.

Based on the absence of suitable habitat or sightings, California red-legged frogs are not expected in the study areas for Power Option 1 or 2. Available aquatic habitats on the Western powerline alignment are limited to irrigated agricultural ditches that provide an unpredictable source of water. The PG&E substation site supports upland habitats that are removed from aquatic sites and California red-legged frogs are not expected at this site.

Reptiles

Federal or State Threatened and Endangered Species

Alameda Whipsnake (*Masticophis lateralis euryxanthus*). Alameda whipsnakes are dependent upon open chaparral, sage scrub, and coastal scrub. However, telemetry data indicate that although home ranges are centered on such shrub communities, they extensively use adjacent habitats, including grassland, oak savanna, and occasionally oak-bay woodland (Swaim, pers. comm., 2007). Alameda whipsnakes use grassland habitats for periods of up to several weeks, with males using grassland habitats more frequently in the mating season and females using grassland habitats after mating occurs. Rock outcrops are an important feature of Alameda whipsnake habitat because they provide retreat opportunities and promote lizard populations (USFWS, 2002; 2005b).

While Alameda whipsnakes are regularly observed in nonscrub areas, the ultimate role of such habitat in the life history of this snake species is still emerging. The loss of neighboring nonscrub habitat could reduce overall habitat quality for whipsnakes (Swaim, pers. comm., 2007). While it is not fully understood how far or often Alameda whipsnakes venture away from scrub habitat, or whether such movements represent individuals that have become permanently separated from scrub habitat, recent studies by Swaim (pers. comm.) indicate that the snakes routinely move several miles farther from scrub habitat than previously described.

Historically, Alameda whipsnakes were probably found in the coastal scrub and oak woodland communities of the East Bay in Contra Costa, Alameda, western San Joaquin, and northern Santa Clara Counties (USFWS, 2002). Currently, they are only found in the inner Coast Range in western and central Contra Costa and Alameda Counties (USFWS, 2002). Five isolated populations of Alameda whipsnake are now recognized within its historical range: Tilden–Briones, Oakland–Las Trampas, Hayward–Pleasanton Ridge, Sunol–Cedar Mountain, and Mt. Diablo–Black Hills (USFWS, 1997a).

The Los Vaqueros Watershed falls within the range of the Mt. Diablo-Black Hills population of Alameda whipsnake; thus, the Alameda whipsnake is presumed extant in the chaparral habitats of the southwestern portion of the watershed, and adjoining nonscrub habitat. The CNDDB notes occurrences of the Alameda whipsnake within the watershed vicinity, and Alameda whipsnakes have been recorded in upland scrub habitat in the southwestern portion of the watershed where the quality of habitat is very high (Jones and Stokes, 1990). In 2003 and 2004, field surveys also found Alameda whipsnakes within the watershed, and all age classes (adult, sub-adult, and young of the year) were found in these surveys (D. McGriff, pers. comm., 2004). Moreover, Alameda whipsnake have been documented from at least three grassland areas that do not include chaparral habitat (ESA, 2004).

Alameda whipsnake habitat is not present near any other facilities associated with the project alternatives.

Federal or State Species of Special Concern

Western Pond Turtle (*Actinemys marmorata*). Western pond turtles are commonly found in ponds, lakes, marshes, rivers, streams, and irrigation ditches with rocky or muddy substrates surrounded by aquatic vegetation. These watercourses usually are within woodlands, grasslands, and open forests, between sea level and 6,000-foot elevation. Turtles bask on logs or other objects when water temperatures are lower than air temperatures. Nests are located at upland sites, often up to 0.25 mile from an aquatic site (Jennings and Hayes, 1994; Stebbins, 2003; Zeiner et al., 1988–1990).

Western pond turtles are uncommon and discontinuously distributed throughout California west of the Cascade-Sierran crest, with isolated populations in the Mojave River area and Andreas Canyon (Jennings and Hayes, 1994). Western pond turtle populations occur throughout the Marsh Creek Watershed and Kellogg Creek within the Los Vaqueros Watershed (East County HCPA, 2006; CDFG, 2008).

Within the watershed, a variety of habitats such as creeks, ponds, and drainages, as well as semipermanent marsh, alkali marsh, riparian woodland, and some grasslands, provide pond turtle habitat. They correspond to lacustrine, nontidal freshwater permanent emergent, and valley/foothill riparian NCCP habitats within the watershed. Western pond turtles are known throughout the watershed. Western pond turtle populations are present in Adobe Creek (west arm of Kellogg Creek), along Upper and Lower Kellogg Creek, in several created wetlands and stock ponds, and in drainages within the watershed (Jones and Stokes, 1990; Dave Sterner, pers. comm.; CDFG, 2008). Of the six stock ponds, five created wetlands, and several drainages in the study area, one stock pond, one created wetland, and two drainages are known to support the western pond turtle. The stock pond is along Horseshoe Creek in a southeastern arm of the reservoir, the created wetland is along an unnamed drainage in an eastern arm of the reservoir, and the drainages are Upper and Lower Kellogg Creek.

Within the construction easement for Los Vaqueros Dam and associated Inlet/Outlet Pipelines, five western pond turtle occurrences are known from created wetlands, with suitable habitat in Lower Kellogg Creek. In addition, one stock pond along Adobe Creek is within the construction easement for the proposed westside access road, and one occurrence is within the stockpile study area. Western pond turtles may be present in aquatic habitats and upland areas within roughly 0.5 mile of aquatic sites.

The occurrence nearest to the Old River Intake and Pump Station is almost 2 miles south at Clifton Court Forebay (CDFG, 2008). While no pond turtle occurrences are reported near the study area for the new Delta Intake and Pump Station, Old River and Middle River may provide suitable aquatic habitat, and nearby levee banks and agricultural lands may provide suitable egg-laying habitat for this species. Therefore, western pond turtle may sporadically occur in and near the new Delta Intake and Pump Station study area.

The Delta-Transfer Pipeline traverses mostly cropland, but several aquatic sites occur within the study area that may be used by the western pond turtle. No CCWD or CNDDB pond turtle occurrences are reported within the study area; the nearest occurrence is 1.5 miles to the south (CDFG, 2008). However, western pond turtles can be expected to occur in association with Kellogg Creek and the numerous larger irrigation canals (e.g., Byron-Bethany Canal) in agricultural portions of the study area.

Three pond turtle occurrences are reported in the Transfer-LV Pipeline study area (CDFG, 2008). Reported locations include areas along Lower Kellogg Creek where several stock ponds and created wetlands support western pond turtles. All ponds, wetlands including Kellogg Creek, stock ponds, and adjacent upland habitat are suitable for the western pond turtle.

The Transfer-Bethany Pipeline crosses several small creeks that may support wetlands and habitat for western pond turtles. This species is expected to occur in and near aquatic sites that provide suitable aquatic habitat.

Western pond turtles may be present in irrigation and drainage features within the Western powerline alignment under Power Options 1 and 2, with breeding and movement in project area upland habitat potentially within the alignments and at the Western substation siting zone under Power Option 1. An occurrence is noted near Italian Slough, west of the Skinner Delta Fish Protective Facility (CDFG, 2008). Aquatic habitat does not occur at the Western substation site. Because western pond turtles can persist with unpredictable water sources, they may be present in and near agricultural ditches that parallel and cross the alignment at various locations. Western pond turtles may be present in upland habitat near the proposed PG&E substation under Power Option 2.

San Joaquin Whipsnake (Coachwhip) (*Masticophis flagellum ruddocki*). San Joaquin whipsnakes use open, dry areas with little or no tree cover. In the western San Joaquin Valley, they occur in valley grassland and saltbush scrub associations and are known to climb shrubs and bushes to view prey and potential predators. They use small mammal burrows for refuge and probably for egg-laying sites as well (Jennings and Hayes, 1994).

San Joaquin whipsnakes range from the eastern edge of the San Joaquin Valley from Colusa County southward to Kern County and into the inner South Coast Ranges, with an isolated population in the Sutter Buttes. Of 65 occurrences recorded in the CNDDB, five are from Alameda, Contra Costa, and San Joaquin Counties (CDFG, 2008).

In 1980, a San Joaquin whipsnake was identified in the footprint of the Los Vaqueros Reservoir Dam (CDFG, 2008). No other occurrences are reported in the Los Vaqueros Watershed or near any other project facilities. The watershed provides suitable open grassland habitat for San Joaquin whipsnakes; therefore, this species can be expected in grassland habitat throughout the study area.

This species is not expected in the Delta Intake Facilities study area due to the lack of suitable habitat. For Conveyance Facilities, San Joaquin whipsnakes are expected to sporadically occur in low densities in annual grasslands within the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline alignments, and in grasslands near the Expanded Transfer Facility. Based on the availability of suitable habitat, this species may also occur in grasslands in the study areas for Power Option 2.

Coast Horned Lizard (*Phrynosoma coronatum frontale*). The coast horned lizard occurs in several habitat types, including areas with an exposed gravelly-sandy substrate containing scattered shrubs, clearings in riparian woodlands, dry uniform chamise chaparral, and annual grassland with scattered perennial seepweed or saltbush. Horned lizard populations reach maximum abundance in sandy loam areas and on alkali flats often dominated by iodine bush. Coast horned lizards use small mammal burrows or burrow into loose soils under surface objects during extended periods of inactivity or hibernation (Jennings and Hayes, 1994). This species is not documented from the Los Vaqueros Watershed, and the nearest documented sighting is about 1.2 miles west of Byron Hot Springs and 0.5 mile west of the Transfer-Bethany Pipeline (CFDG, 2008).

Alkali areas with sandy loam soils and alkali flats have limited distribution in the project area. High quality habitat is present in the Power Option 2 Western powerline alignment, just north of the Skinner Delta Fish Protective Facility and would be spanned by powerlines.

Birds

Federal or State Threatened and Endangered Species

Swainson's Hawk (*Buteo swainsoni*). Swainson's hawks are large migratory hawks that nest in North America and winter in southern South America. Swainson's hawks begin arriving in California in late February and depart for their wintering grounds in early September (Woodbridge, 1998). Nests are typically constructed in sturdy trees within or near agricultural lands, riparian corridors, and roadside trees. Nests are composed of a platform of sticks, bark, and fresh leaves. Swainson's hawks reside in the Central Valley from March though October, with eggs typically laid in April and early May (peaking in late April) (Bradbury, pers. comm.).

The Swainson's hawk nesting range is restricted to portions of the Central Valley and Great Basin regions, where suitable habitat is still present (Shuford and Gardali, 2008). The highest density currently is in the Central Valley, between Sacramento and Modesto, and in the northern San Joaquin Valley (Woodbridge, 1998). Because much of the project area traverses annual grasslands, potential nesting sites are limited in the project area.

Neither CCWD nor the CNDDB report Swainson's hawks nesting in the Los Vaqueros Watershed, with a single nest site reported near out-of-watershed facilities. The *Contra Costa Breeding Bird Atlas* (2005) notes nesting in the area northeast of the watershed and CCWD staff have observed individual Swainson's hawks in the watershed. Grassland and riparian communities in the watershed may provide limited foraging habitat; however, agricultural lands are this species' primary foraging grounds. Though not identified during CCWD or ESA surveys, Bradbury (pers. comm.) considers that Swainson's hawk may nest in the watershed.

For Conveyance Facilities, the Delta-Transfer Pipeline does not support Swainson's hawk nesting habitat, but a cottonwood tree 300 feet from the alignment supported nesting in 2006 (CDFG, 2008) (**Figure 4.6-9**). This is an active agricultural area.

For the Transfer-LV Pipeline alignment, habitat in the study area is a mixture of agriculture lands and grasslands that provide foraging habitat. The patchy cottonwood riparian corridor of Kellogg Creek may provide suitable nesting habitat for Swainson's hawk, but nesting has not been documented from this area. While most of the project pipeline alignments traverse annual grasslands habitat and agricultural lands that are devoid of nesting sites, Swainson's hawk may nest in individual trees scattered along pipeline study areas.

Nesting habitat is not present at the Delta Intake Facilities, Expanded Transfer Facility, or within the study areas for Power Options 1 and 2 and nesting is unlikely near other facilities.

Bald Eagle (*Haliaeetus leucocephalus*). Bald eagles occupy a wide range of habitats, including woodlands, forests, grasslands, and wetlands. They winter throughout California near lakes, reservoirs, rivers, and some rangelands and coastal wetlands. Nesting is usually restricted to mountainous habitats near reservoirs, lakes, and rivers. Bald eagles usually nest in large coniferous trees within 1 mile of permanent water. They forage on large water bodies or rivers with easily approached snags and other perches (Zeiner et al., 1988–1990).

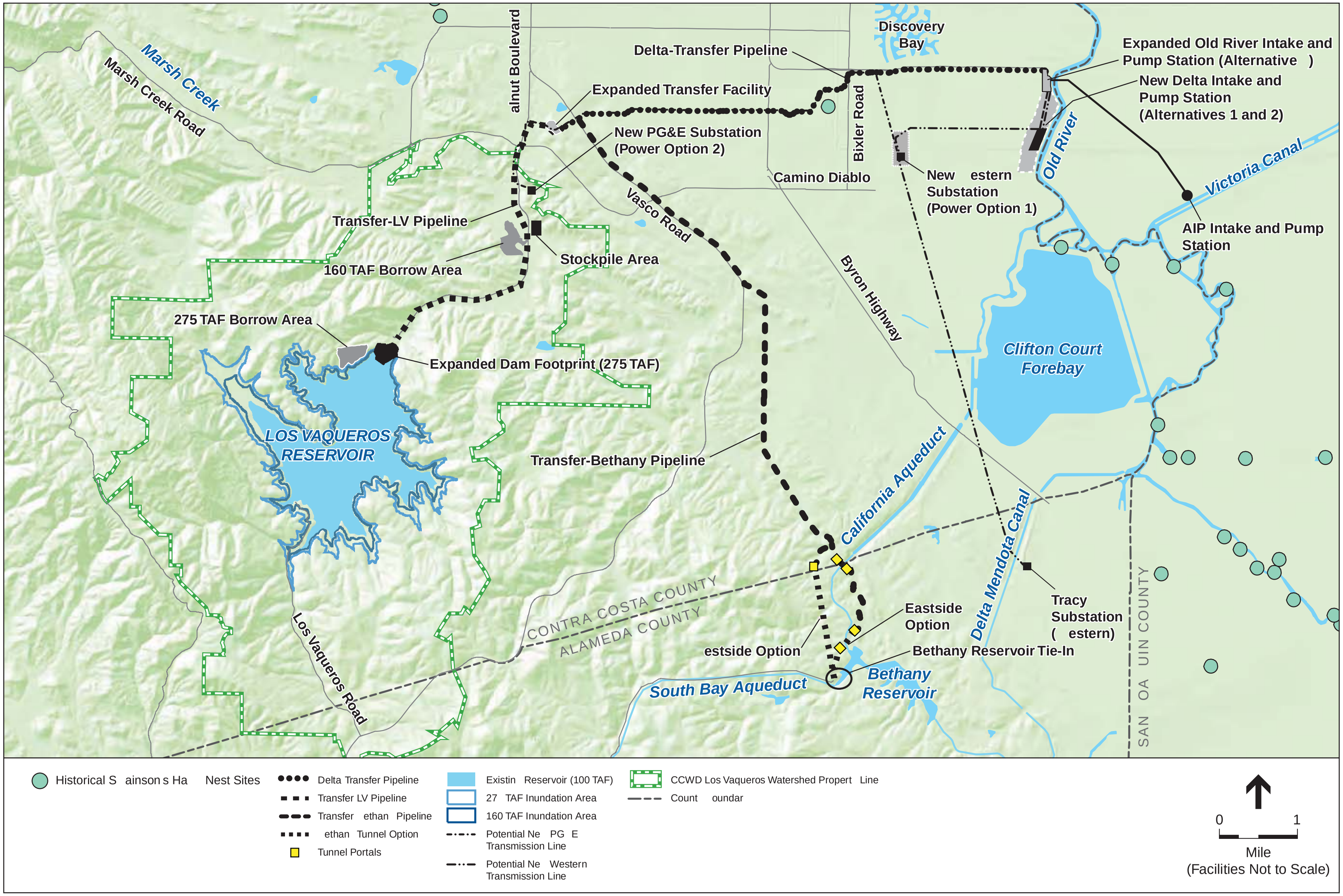
The nearest reported bald eagle nest sites are reported at Del Valle Reservoir in Alameda County, 15 miles southeast of the Los Vaqueros Watershed (CDFG, 2008); and since 2006, bald eagles have also nested at San Pablo Reservoir in Contra Costa County, about 25 miles west of the watershed (CDFG, 2008).

Bald eagles winter in small numbers near Los Vaqueros Reservoir, and remain in the area into the spring and summer months. Winter roosting sites in the watershed have been observed in valley/foothill woodland and forest habitats. Before the establishment of the existing reservoir, bald eagles were not documented from the watershed, although anecdotal information suggests that they occasionally wintered in the Kirker Creek drainage, near the City of Pittsburg (D. Sterner, pers. comm.). As of 2008, bald eagles are not nesting within the Los Vaqueros Watershed. Habitat suitability within the watershed is limited by the relative lack of tall conifers available for nesting. The *Contra Costa Breeding Bird Atlas* (2005) does not report bald eagles in the regional project vicinity.

Outside the watershed, the project area does not provide bald eagle nesting or foraging habitat.

Federal or State Species of Special Concern

Cooper's Hawk (*Accipiter cooperii*). Cooper's hawks nest in dense forested habitats near freshwater and forage mostly on small birds and mammals, although they will take reptiles and amphibians. The peak nesting season is May through July, although it can occur anywhere from March to August (Zeiner et al., 1988–1990). Nesting is described within the Los Vaqueros Watershed, about 2.75 miles west from the existing dam (Brady and Associates, 1996). The



SOURCE: USGS, 1993 (base map); ones Sto es Associates, 1992; and ESA, 2007

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Figure 4.6-
S ainson s Ha Nestin Sites in the Project Stud Area

Contra Costa Breeding Bird Atlas (2005) also indicates that Cooper's hawks are a possible breeder in the western portion of the watershed, and confirms nesting farther to the west.

This species is expected to nest in the wooded portions of the Transfer-LV Pipeline and Transfer-Bethany Pipeline study areas. Nesting habitat is not present at the Delta Intake Facilities, Expanded Transfer Facility, or within the study areas for Power Options 1 and 2, and nesting is unlikely near other facilities.

Sharp-shinned Hawk (*Accipiter striatus*). The sharp-shinned hawk occupies a wide variety of forests and woodland habitats, ranging from mixed deciduous forests, riparian woodlands, to oak woodlands, among others. Like the Cooper's hawk, this species forages in dense forested habitats near freshwater and forages mostly on small birds, though they will take small mammals, frogs, lizards, and insects.

This species was not described in the Los Vaqueros Resource Management Plan (Brady and Associates, 1996), which characterized special status wildlife species known to occur in the Los Vaqueros Watershed. The *Contra Costa Breeding Bird Atlas* (2005) indicates that sharp-shinned hawks are a possible breeder west of the Los Vaqueros Watershed, but does not identify nest sites in the watershed. Similarly, the CNDDB reports no nesting occurrences within 10 miles of the Los Vaqueros Watershed. However, suitable nesting and foraging habitat is present throughout woodlands in the Los Vaqueros Watershed, and this species may be present.

Sharp-shinned hawks are expected to nest in the wooded portions of the Transfer-LV Pipeline and Transfer-Bethany Pipeline study areas. Nesting habitat is not present at the Delta Intake Facilities, Expanded Transfer Facility, or within the study areas for Power Options 1 and 2, and nesting is unlikely near other facilities.

Tricolored Blackbird (Nesting Colony) (*Agelaius tricolor*). Tricolored blackbirds are a colonial species that nest in dense vegetation in and around freshwater wetlands. When nesting, tricolored blackbirds generally require freshwater wetland areas large enough to support colonies of 50 pairs or more. They prefer freshwater emergent wetlands with tall, dense cattails or tules for nesting, but will also breed in thickets of willow, blackberry, wild rose, or tall herbs. During the nonbreeding season, flocks are highly mobile and forage in grasslands, croplands, and wetlands (Zeiner et al., 1988–1990).

Tricolored blackbirds are locally common throughout the Central Valley and coastal areas south of Sonoma County. The East County HCP/NCCP (East County HCPA, 2006) considered tricolored blackbirds a sporadic resident of their inventory area.

The CNDDB notes four tricolored blackbird occurrences near the watershed, but nesting has not been documented within the watershed. Two are about 3 miles north from the existing dam and the other two are about 3 and 5 miles, respectively, southeast of the watershed. Grasslands and freshwater permanent wetlands in the watershed provide suitable nesting habitat for tricolored blackbirds, and tricolored blackbirds are known to use the watershed during the nonbreeding season (Jones and Stokes, 1990). During project surveys, no nesting colonies were found in the watershed (Jones and Stokes, 1989); however, the *Contra Costa Breeding Bird Atlas* (2005) cites breeding within the watershed and confirms breeding east and south of the watershed. Tricolored blackbirds may sporadically breed in the watershed where suitable habitat is available.

Potential nesting habitat is present on the opposite side of Old River from the new Delta Intake and Pump Station, but nesting has not been observed at this location. Along the Delta-Transfer Pipeline, suitable breeding sites may occur on the fringes of agricultural areas and in unmaintained irrigation canals throughout the study area. On the Transfer-LV Pipeline, in addition to multiple nesting sites that are available in Kellogg Creek, cropland habitats within the study area may provide suitable tricolored blackbird nesting sites.

A tricolored blackbird breeding colony was documented about 800 feet west of the Transfer-Bethany Pipeline and two more occurrences are reported 2.5 miles south of this alignment (CDFG, 2008). This alignment traverses annual grassland communities that are broken by small creek drainages that could support a tricolored blackbird nesting colony.

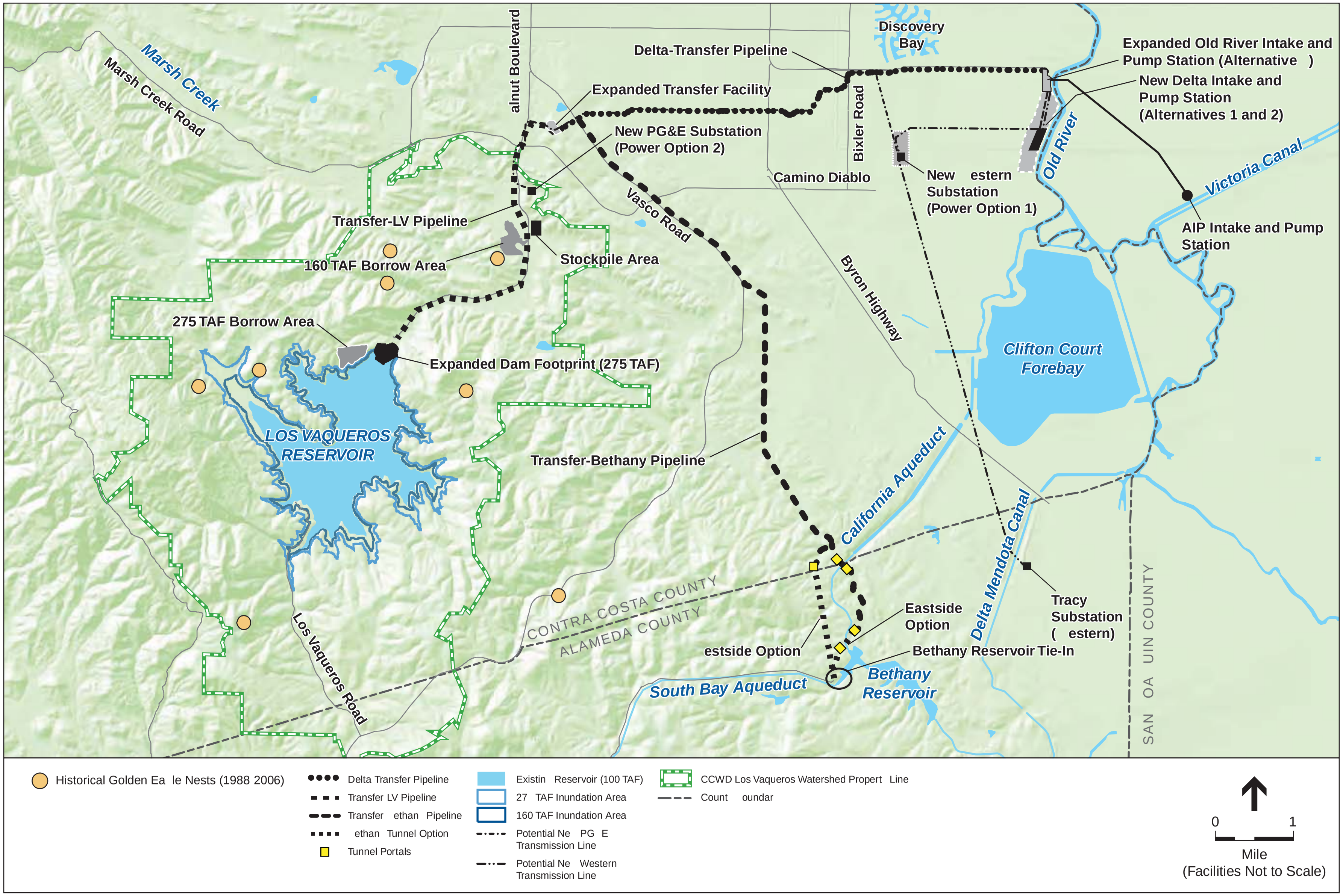
Tricolored blackbird nesting could occur in mustard fields and annual grassland communities on the Western powerline alignment under Power Options 1 and 2, or in association with agricultural drainages on these alignments. Breeding may occur locally to the Western substation siting zone under Power Option 1. This species is not expected at new PG&E facilities under Power Option 2.

Golden Eagle (*Aquila chrysaetos*). Golden eagles nest in open areas on cliffs and in large trees, often constructing multiple nests in one breeding territory (Zeiner et al., 1988–1990). They prefer open habitats such as rolling grasslands, deserts, savannahs, and early successional forest and shrub habitats, with cliffs or large trees for nesting and cover (Zeiner et al., 1988–1990).

Portions of seven golden eagle breeding territories have been documented in the Los Vaqueros Watershed and nesting areas change slightly from year-to-year. Four of these territories were active in 2002; two failed and three young were fledged from the other two nests (CCWD, 2002). This species is a resident breeder within the watershed and the area is also used by migrant eagles during the nonbreeding season.

One historic breeding site was identified in the watershed study area 16 feet from the edge of the proposed westside access road. Several nest sites occur within 2 miles of the inundation boundary and other in-watershed facilities (e.g., the dam, Inlet/Outlet Pipelines construction area, recreational facilities, westside access road, and eastside trail). As eagles abandon nest sites in some years and start new ones in other locations, the visual representation of eagle nest sites in the watershed tends to overstate the number of active eagle nests during a given year (i.e., many nest sites are inactive or historic) (**Figure 4.6-10**).

Golden eagle foraging habitat is present in all project study areas; however, potential breeding sites only occur in the watershed, and along portions of the Transfer-LV Pipeline within the watershed.



SOURCE: USGS, 1993 (base map); ones Sto es Associates, 1992; and ESA, 2007

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Figure 4.6-10
Golden Ea le Nestin Sites in the
Project Stud Area

Western Burrowing Owl. Western burrowing owls are relatively small, semicolonial owls, and are mostly residents of open dry grasslands and desert areas. They occupy burrows for both breeding and roosting. They use burrows excavated by ground squirrels and other small mammals and will use human-made burrows and cavities. Where the number and availability of natural burrows is limited, owls may occupy human-made burrows such as drainage culverts, cavities under piles of rubble, discarded pipe, and other tunnel-like structures (Zeiner et al., 1988–1990). Burrowing owls hunt from perches and are opportunistic feeders. They consume arthropods, small mammals (e.g., meadow voles), birds, amphibians, and reptiles. Insects are often taken during the day, while small mammals are taken at night (Zeiner et al., 1988–1990).

The *Contra Costa Breeding Bird Atlas* (2005) confirms owl breeding within and just to the east of the watershed, but not near the reservoir. Surveys conducted before the reservoir's development documented up to 10 pairs of owls within the watershed (Jones and Stokes, 1989). These occurrences were mostly in the eastern portion of the watershed with a few occurrences from the southern watershed and several in the northern end of the watershed (nesting status unknown).

Burrowing owls have been casually observed in non-project portions of the watershed (B. Pittman, pers. obs.) but their distribution is not specifically tracked by watershed staff. Occurrences are generally 1 to 2 miles from the inundation zone. The nearest CNDDB occurrence is about 1 mile east of the 275-TAF reservoir study area.

Potential burrowing owl nesting habitat is present on the fringes of agricultural lands and in annual grasslands in the study area along the Delta-Transfer Pipeline, Transfer-LV Pipeline, Transfer-Bethany Pipeline, and to a lesser extent at the Expanded Transfer Facility. A CDFG-documented population was observed within the Western powerline alignment under Power Option 2 (CDFG, 2008). Though nesting habitat is unavailable over most of the study areas for Power Options 1 and 2, due to agricultural activities and pasture irrigation, burrowing owls are presumed present on the fringes of agricultural lands and in uncultivated annual grasslands in both alignments.

Short-Eared Owl (*Asio flammeus*). The short-eared owl is an open-country bird that is seen most often at dawn and dusk. Short-eared owls usually nest on dry ground in depressions that are concealed by vegetation, sometimes nesting within burrows. Breeding is from early March through July with a typical clutch size of five to seven eggs. This owl is a widespread winter migrant with resident populations in portions of California (Shuford and Gardali, 2008). The short-eared owl is one of the most widely distributed owls in the world.

No breeding records or winter sightings are reported from the Los Vaqueros Watershed or near any project facilities. Breeding occurrences are not documented in the Los Vaqueros Watershed vicinity by the *Contra Costa Breeding Bird Atlas* (2005) or by CDFG (2008); however, this owl may occur sporadically in annual grasslands throughout the project area.

Northern Harrier. Northern harriers are found in a wide variety of habitats from annual grasslands up to lodgepole pines and alpine meadow habitats. They are known to frequent meadows, grasslands, open rangelands, desert sinks, and freshwater and saltwater emergent wetlands. Harriers are seldom found in wooded areas. Nests are constructed amid shrubby vegetation usually in emergent wetlands or near a river or lake. They may also nest in grasslands, grain fields, or sagebrush flats several miles from water (Zeiner et al., 1988–1990). Northern harriers are commonly observed foraging over croplands, marshlands, or grasslands within the project region.

The watershed provides suitable open grassland nesting habitat for northern harrier. The nearest breeding occurrences to the Los Vaqueros Watershed are 6 miles southwest and 9 miles east of the existing dam (CDFG, 2008). The *Contra Costa Breeding Bird Atlas* (2005) indicates that breeding is probable within the watershed, confirmed east of the watershed, and possible north of the watershed. Based on the availability of suitable habitat, this species may nest near marshland habitats in the watershed.

Due to disturbances caused by facilities and levee maintenance, and ongoing farming activities, northern harriers are unlikely to nest in tall grasslands in the Delta Intake Facilities study area.

The Delta-Transfer Pipeline traverses open cropland and grassland habitat that is suitable for harrier nesting. This species may also nest in alkali grasslands and tall fields in the Delta-Transfer Pipeline study area. The Transfer-LV Pipeline, Transfer-Bethany Pipeline, and study areas for Western powerlines under Power Options 1 and 2 traverse open grassland habitat that is suitable for northern harrier foraging and nesting. The breeding occurrence identified east of the dam is a 1989 sighting south of Clifton Court Forebay, about 4 miles east of the Transfer-Bethany Pipeline alignment (CDFG, 2008).

The Expanded Transfer Facility is in open grassland habitat suitable for foraging, but the grasslands are generally too tall and weedy to support harrier nesting.

White-Tailed Kite (*Elanus leucurus*) (Nesting). White-tailed kites forage in open grasslands, meadows, farmlands, and emergent wetlands. They typically nest in oak woodlands or trees, especially along marsh or river margins, although they will use any suitable tree or shrub that is of moderate height. They are rarely found far from agricultural areas (Zeiner et al., 1988–1990).

The watershed provides suitable open foraging and nesting habitat for white-tailed kite. The *Contra Costa County Breeding Bird Atlas* (2005) reports kite breeding in the watershed. The CNDDB occurrence closest to the watershed is about 7.5 miles southeast of the inundation boundary, in Contra Costa County (CDFG, 2008). This species may nest in oaks, cottonwoods, and other trees within the watershed.

The Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline traverse open cropland and grassland habitat that is suitable for foraging, and wooded areas suitable for nesting. Cropland and grasslands habitat within the Western powerline alignment and at the Expanded Transfer Facility are not suitable for nesting. Though no occurrences are identified in these areas by the CNDDB or Contra Costa County Breeding Bird Atlas, this species may nest in the study area wherever habitat conditions are appropriate.

California Horned Lark (*Eremophila alpestris*). California horned larks are brown songbirds that form large flocks for foraging and roosting. They build grass-lined nests directly on the ground, in dry, open habitats with sparse vegetation. This species is a common to abundant resident songbird in a variety of open habitats. Range-wide, California horned larks breed in level or gently sloping shortgrass prairie, montane meadows, barren fields, opens coastal plains, fallow grain fields, row crops, and alkali flats.

Horned larks range across North America from Alaska and the Canadian arctic southward to southern Mexico. Though no occurrences are identified in the Los Vaqueros Watershed by the CCWD, CNDDB, or *Contra Costa County Breeding Bird Atlas*, this species is expected to nest in short grasslands that occur throughout the study area.

This species is persistently present in portions of the Altamont Hills in Alameda and Contra Costa counties where regular grazing helps to maintain annual grasses at a short height (B. Pittman, pers. obs.). This species is expected to breed and forage in short annual grasslands within the Los Vaqueros Watershed and at the following facilities: the westernmost 1.2 miles of the Delta-Transfer Pipeline; the entirety of the Transfer-Bethany Pipeline and Transfer-LV Pipeline alignments; within the Western powerline alignment under both Power Options, and at proposed PG&E facilities under Power Option 2.

Prairie falcon (*Falco mexicanus*). Habitat use of the prairie falcon includes annual grasslands to alpine meadows, but they are also associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. In California this species is a year-round resident in suitable habitat throughout most of the state. In the Central Valley, prairie falcons are typically only observed during winter and not during the nesting season (CDFG, 1983).

Eastern Contra Costa and Alameda Counties are within the year-round range of the prairie falcon. Breeding habitat, which includes cliffs and bluffs, is extremely limited near facilities associated with the project alternatives. As a result, the likelihood of encountering prairie falcon nest sites is considered low at all facilities tied to the project alternatives.

Loggerhead Shrike (*Lanius ludovicianus*). Loggerhead shrikes are a semipermanent resident California species that occurs in abundance in the Central Valley and Central Coast where shrub habitats and open woodlands are available. Shrikes generally forage on the fringes of open habitats where suitable hunting perches are available. This species typically hunts from dead trees, tall shrubs, utility wires and fences, impaling their prey on sharp twigs, thorns, or barbed wire.

The breeding distribution of this species is not well characterized by the CNDDB; however, loggerhead shrike populations are readily encountered within appropriate habitat in the outer Coast Range of eastern Contra Costa and Alameda Counties (B. Pittman, pers. obs.). Populations are known from wooded riparian corridors and grazed lands, with breeding often occurring in blackberry and willows ranging in size from individual shrubs to dense thickets.

Shrikes are common throughout California and are expected to occur in moderate to high densities throughout the project area where shrubby wooded habitat provides adequate cover and nesting sites.

Within the Los Vaqueros Watershed, loggerhead shrike may be encountered near wooded drainages or areas with moderate to dense shrub cover. Habitat in the watershed occurs sporadically in and next to Kellogg Creek and tributary drainages. Due to the lack of perch sites and cover, this species is not expected to breed near the Delta Intake Facilities, but may be encountered sporadically on each of the pipeline alignments where shrubby vegetation is present. This species may breed sporadically within the study areas for Power Option 1 and 2.

Osprey (*Pandion haliatus*). Ospreys are a unique species that build stick platform nests on top of large dead-topped trees or snags. Nests are occasionally built on cliffs, human-made structures, or the ground. Ospreys are closely tied to large bodies of clear water that produce fish and are surrounded by ponderosa pine or mixed conifer habitats. Tall trees and snags are required for breeding, foraging, and cover. Nests are usually built within 1,500 feet of fish-productive water, but may be built up to a mile from water (Zeiner et al., 1988–1990).

During the breeding season ospreys can be found in Northern California from the Cascade Ranges south to Lake Tahoe and along the coast south to Marin County. They are also uncommonly found breeding along the Colorado River (Zeiner et al., 1988–1990). Historically, they bred throughout much of California (Remsen, 1978). Osprey nesting occurrences are scattered throughout Northern California, with concentrations in Humboldt and Lassen Counties (CDFG, 2008). One breeding occurrence is reported from San Joaquin County, along the Mokelumne River.

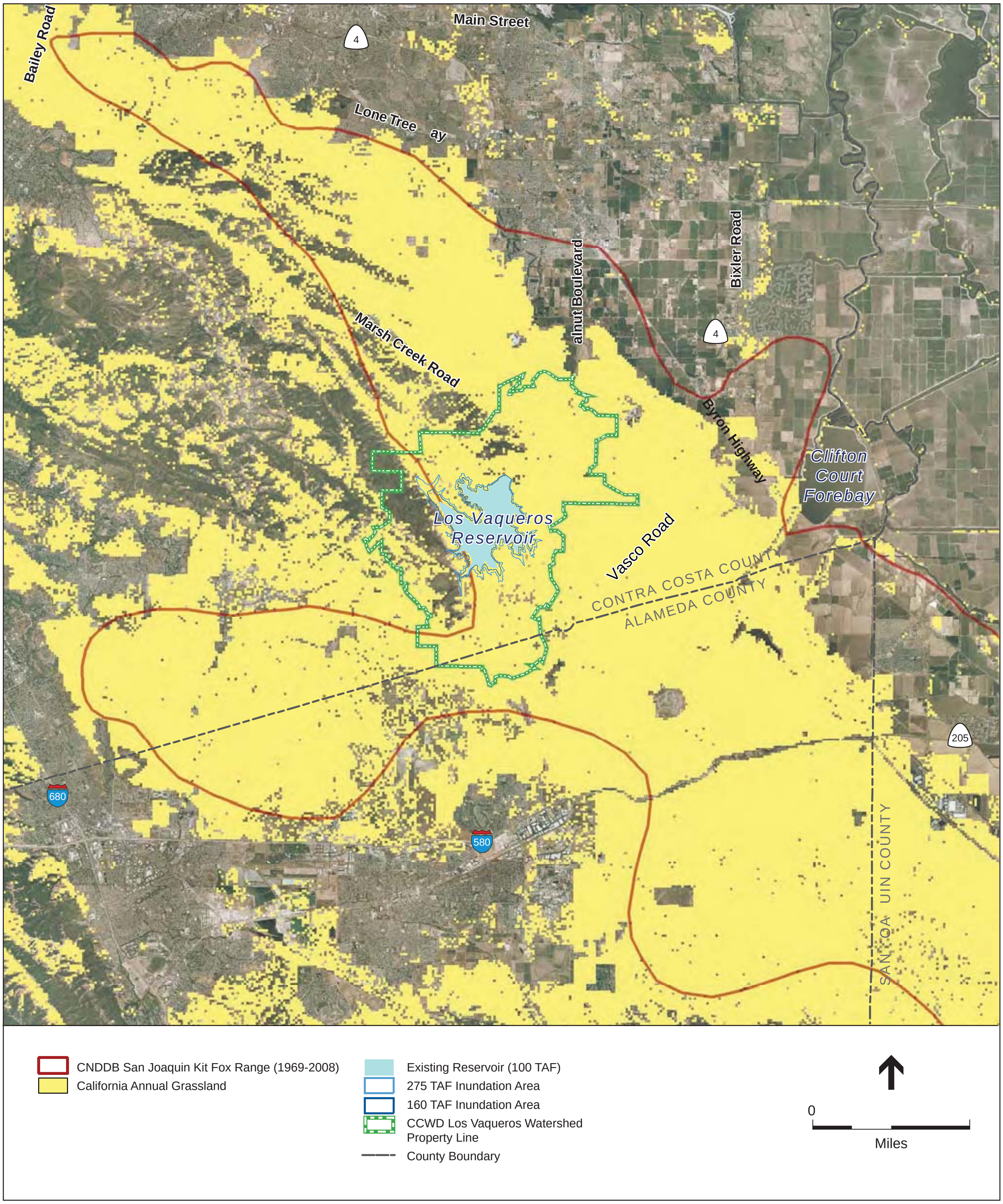
The *Contra Costa County Breeding Bird Atlas* (2005) cites osprey breeding in the watershed and areas east of the watershed. Nesting has been noted in the watershed by CCWD staff and the potential exists that they may breed in oak woodlands or large snags (i.e., dead trees) throughout the watershed. Ospreys are unlikely to breed in study areas outside the watershed.

Mammals

Federal or State Threatened and Endangered Species

San Joaquin Kit Fox. The San Joaquin kit fox is a permanent resident of arid grasslands and open scrubland, where friable soils are present. Dens are required year-round for reproduction, shelter, temperature regulation, and protection from predators (USFWS, 1998). Historically their habitat included native alkali marsh and saltbush scrub of the valley floor, but the availability of such habitats has diminished markedly due to agricultural conversion. Grasslands with friable soils are considered the principal habitat for denning, foraging, and dispersal, while open oak woodlands provide lower quality foraging and dispersal habitat. Kit foxes will use habitats that have been extensively modified by humans, including grasslands and scrublands with active oil fields, wind turbines, and agricultural matrices (USFWS, 1998). In the northern portion of its range, California ground squirrels are a chief component of the kit fox diet (Hall, 1983).

San Joaquin kit foxes occur only in and around the Central Valley, inhabiting open habitat in the San Joaquin Valley and surrounding foothills. Kit fox population densities are greatest in the southern portion of their range. Kit fox populations in the northern portion of their range are highly fragmented and sparsely distributed (**Figure 4.6-11**) (Orloff et al., 1986).



SOURCE: CDF, 2002; USDA, 2006; CNDD , 2006; ESRI, 2006; and ESA, 2008

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Figure 4.6-11
Re ional Distribution of
San oaquin it Fox

In the northern portion of its range, kit fox are present primarily in foothill grasslands, because much of their former habitat on the valley floor has been eliminated. The northern population is known to have different habitat characteristics than the southern population. Orloff found that the northern population habitats have steeper slopes than the southern population, with slopes of up to 40 degrees in the northern population and dens on slopes ranging from 2 to 14 percent (Orloff et al., 1986). Thus, slope is an important consideration to keep in mind when considering potential project effects to kit fox and the suitability of mitigation lands for this species.

While kit foxes have been observed to use areas with low to moderate slopes (Morrell, 1971, 1972; O'Farrell et al., 1980; O'Farrell and McCue, 1981; Orloff et al., 1986), this species preferentially dwell and migrate on relatively flat or low-gradient slopes (e.g., less than 15 degrees) as opposed to more extreme slopes (Orloff et al., 1986; Larsen, pers. comm.).

Most studies only quantify the slopes where dens are found, and do not quantify slopes in areas of dispersal. Morrell (1971) studied kit fox in Kern County and found that most dens are in flat or gently sloping ground; some are on hillsides up to 30 degrees. Dens on very steep slopes were rare. Koopman et al. (2001) conducted a telemetry study in Kern County and found that most kit foxes used slopes that were generally less than 6 degrees. The mean slope for movements was 3.3 degrees (range = 0 to 71 degrees) with only 0.9 percent of movements on slopes greater than 6 degrees. A study at Camp Roberts in Monterey County showed that the average slope of hillsides with dens was 19 degrees (Reese et al., 1992).

The CNDDB reports 21 kit fox occurrences from Contra Costa, San Joaquin, and Alameda Counties, and numerous others are reported from other sources such as unpublished USFWS data. The watershed is in the northwestern extent of the San Joaquin kit fox range. Ten kit fox sightings are reported in the watershed vicinity, the most recent from September 2008 in close proximity to the Los Vaqueros Watershed Administrative Offices (Howard, pers. comm.), and prior to that from the period between 1987 and 1989, in areas now flooded by Los Vaqueros Reservoir (H.T. Harvey & Associates, 1997; CCWD, 2007; CDFG, 2008). Recent kit fox observations from the regional vicinity include a sighting at Brushy Peak in 2002 and Vasco Caves in 2001 and 2002 (CDFG, 2003).

In the upper Kellogg Creek portion of the watershed, two potential north-to-south kit fox movement corridors (passageways with unbroken grasslands) are generally recognized. Such corridors serve to maintain connectivity between blocks of annual grasslands habitat. The corridor to the west of the reservoir is composed of annual grasslands, roughly 500 to 1,800 feet in width, on a moderate east-facing slope. The corridor is interrupted in two locations by oak woodlands that measure roughly 80 feet and 300 feet in width with gentle to moderate topography. Although a potential movement corridor, kit fox use has not been documented in this area.

Annual grasslands east of the reservoir provide a considerably wider migration pathway with kit fox activity verified in the corridor in September 2008 (Howard, pers. comm.). From the base of Los Vaqueros Dam to the northeastern edge of the watershed, the width of this corridor is about 2 miles.

Outside of the watershed, high quality kit fox habitat occurs on each of the pipeline alignments, with lower quality, albeit potential habitat at the Expanded Transfer Facility and near the Delta Intake Facilities. Kit fox occurrence data is maintained by USFWS and generally not distributed publicly.

Along the Delta-Transfer Pipeline, portions of open grasslands and agricultural lands south of SR 4 provide San Joaquin kit fox habitat. This portion of the alignment, which runs from SR 4 to the Expanded Transfer Facility, provides varying degrees of habitat quality for kit foxes. The highest quality areas are annual grasslands within 1.2 miles of the Expanded Transfer Facility, followed by moderate quality areas further east that support walnut orchards and fallow agricultural fields.

The Transfer–LV Pipeline traverses annual grassland habitats that could support kit fox denning, foraging, or dispersal. The linear extent of potential San Joaquin kit fox habitat in this alignment is 4.4 miles.

Nearly the entire Transfer-Bethany Pipeline traverses annual grassland or alkali meadow habitats that could be used for kit fox denning, foraging, or dispersal. This alignment traverses the eastern kit fox dispersal corridor where kit foxes have been sighted within the last 15 years (CDFG, 2008; USFWS file data). The linear extent of San Joaquin kit fox habitat in this alignment is 7.5 miles in Contra Costa County and 1.4 miles in Alameda County (tunnel portion of alignment).

For the Expanded Transfer Facility, the likelihood of encountering kit foxes is considered low due to the tall, ungrazed mustards and other herbaceous vegetation that dominate this site.

The Western powerline alignments and substation under Power Options 1 and 2 are located in moderate to high quality kit fox habitat, and suitable habitat is similarly available at the proposed PG&E facilities under Power Option 2.

Federal or State Species of Special Concern

Because little information is available on the local distribution of bat species in Alameda and Contra Costa counties, the likelihood of encountering special status bat species was estimated from species range maps, which for the bats considered includes most of the State of California, and an evaluation of available habitat in the project study areas. Available data sources identify the only special status bat roost site as 10 miles from proposed facilities. This pallid bat (*Antrozous pallidus*) roost is greater than 6 miles north of the Los Vaqueros Watershed. Thus, while detailed distribution data is not available for the following species, they are included herein because they are not well studied in the project region, and because potentially suitable habitat is available in the Los Vaqueros Watershed. Habitat for these species is generally lacking in project study areas outside of the watershed.

Pallid Bat (*Antrozous pallidus*). Pallid bats inhabit low elevation (< 6,000 feet) rocky arid desert lands and canyonlands, shrub-steppe grasslands, and higher elevation coniferous forests (> 7,000 feet). Pallid bats roost in rock crevices, unoccupied buildings, hollows in large trees, and under bridges. They are most abundant in xeric (dry) ecosystems, including the Great Basin, Mojave, and Sonoran Deserts (WBWG, 2005).

This is the most widely described special status bat species in central California and in the project region, with the nearest occurrences 6 miles north of the Los Vaqueros Watershed (CDFG, 2008). Though not verified within the Los Vaqueros Watershed, habitat for this species is available in large hollow trees, snags, or under loose bark in the watershed study area. Though rock outcrops are common along ridgelines, open rock crevices that could support bat roosts are uncommon in the 275-TAF zone and in project study areas.

Pallid bat habitat is considered limited in portions of the project area outside the watershed, thus, this species is only expected within the watershed.

Townsend's Big-Eared Bat (*Corynorhinus townsendi*). Townsend's big-eared bats have been reported in a wide variety of habitat types including coniferous forests, mixed mesophytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat, ranging from sea level to 3,300 meters (WBWG, 2005). Their most typical habitat is arid western desert scrub and pine forest regions. The CNDDB does not report any locations for this species in the State of California (CDFG, 2008).

Townsend's big-eared bats occur throughout the west with their distribution strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines. Habitat may be available in large trees in the watershed study area, but their more typical cave habitat is absent from this area. Cave habitat in the eastern portion of the Los Vaqueros Watershed is greater than 500 feet from the project study area.

Though not verified within the Los Vaqueros Watershed, habitat for this species is available in large hollow trees, snags, or under loose bark in the watershed study area. Though rock outcrops are common along ridgelines, open rock crevices that could support bat roosts are uncommon in the 275-TAF zone and in project study areas.

Habitat for this species does not occur in study areas outside the watershed.

Greater Western Mastiff Bat (*Eumops perotis californicus*). The greater western mastiff bat prefers open, semiarid to arid habitats with low elevation and rugged, rocky areas that have suitable crevices for roosting. They roost in buildings and trees, provided they have adequate drops to allow them to take flight (Williams, 1986; Zeiner et al., 1988–1990). Greater western mastiff bats are uncommon, widespread residents of the San Joaquin and Salinas Valleys and coastal lowlands south of San Francisco Bay (Williams, 1986; Zeiner et al., 1988–1990).

The nearest documented occurrences are an 1899 collection near Hayward and a 1957 observation from near Oakdale, both greater than 20 miles from the study area (CDFG, 2008).

Open grassland, canyons, and woodland communities in the watershed provide habitat for greater western mastiff bats; however, based on available species distribution data that identifies low densities in the project region, this species is considered unlikely in the project area. Habitat for this species does not occur in study areas outside the watershed.

Small-Footed Myotis Bat (*Myotis ciliolabrum*). Small-footed myotis is distributed in deserts, chaparral, riparian zones, western coniferous forest, and pinyon-juniper forest. Individuals are known to roost singly or in small groups in cliff and rock crevices, buildings, concrete overpasses, caves, and mines.

The range of the small-footed myotis includes much of the State of California and the western half of North America (CDFG, 2005). Roost sites are not documented within 100 miles of the Los Vaqueros Watershed (CDFG, 2008). Based on the described distribution of roost sites and lack of cliffs and rock crevices in the Los Vaqueros Watershed study area, a low likelihood exists that this species would be encountered in the watershed.

Due to the lack of suitable structural habitat in study areas outside the watershed, this species is not expected in these areas.

Long-Eared Myotis Bat (*Myotis evotis*). The long-eared myotis bat is found predominantly in coniferous forests, typically only at higher elevations in southern areas (between 7,000 and 8,500 feet). Individuals roost under exfoliating tree bark, and in hollow trees, caves, mines, cliff crevices, sinkholes, and rocky outcrops on the ground. They also sometimes roost in buildings and under bridges. Pregnant long-eared myotis bats often roost at ground level in rock crevices, fallen logs, and even in the crevices of sawed-off stumps, but they cannot rear young in such vulnerable locations.

These bats are endemic to the west, ranging from southwestern Canada, south through California into Baja, eastward through northern Arizona and New Mexico, and north into the Dakotas (WBWG, 2005). The nearest described sightings are about 60 miles to the north in Chiles Valley (Napa County) and 95 miles to the east in Stanislaus National Forest (Tuolumne County) (CDFG, 2008). Based on this species' described range, which includes much of California, it cannot be ruled out from the project area. However, the likelihood that it may roost in trees and rocky outcrops in the watershed is low.

Due to the lack of suitable structural habitat in study areas outside the watershed, this species is not expected in these areas.

Fringed Myotis Bat (*Myotis thysanodes*). The fringed myotis bat is most common in dry woodlands (oak, pinyon-juniper, ponderosa pine), and is found in a wide variety of habitats including desert scrub, mesic coniferous forest, grassland, and sage-grass steppe. Night and day roosts include caves, mines, and buildings (typically abandoned). Hibernacula include caves and buildings, but not much is known about their wintering whereabouts (WBWG, 2005).

Fringed myotis bats range through much of western North America from southern British Columbia, Canada south to Chiapas, Mexico, and from Santa Cruz Island in California east to the Black Hills of South Dakota.

The nearest described occurrence is a 2005 observation near Crystal Springs Reservoir (San Mateo County), about 40 miles west of the Los Vaqueros Watershed (CDFG, 2008). Based on this species' described range, which includes much of California, it cannot be ruled out in the project area. However, the likelihood that it may roost in rocky outcrops in the watershed is low.

Due to the lack of suitable structural habitat in study areas outside the watershed, this species is not expected in these areas.

Long-Legged Myotis Bat (*Myotis volans*). The long-legged myotis bat is especially dependent on wooded habitats from pinyon-juniper to coniferous forests, usually at 4,000- to 9,000-foot elevations. This species uses abandoned buildings, cracks in the ground, cliff crevices, exfoliating tree bark, and hollows within snags as summer day roosts; caves and mine tunnels as hibernacula (WBWG, 2005). Radio-tracking studies have identified maternity roosts beneath bark and in other cavities.

Long-legged myotis bats are one of western America's most widely distributed bat species. Long-legged myotis bats range across western North America from southeastern Alaska, British Columbia, and Alberta in Canada to Baja California and central Mexico. It occurs throughout the western United States from the Pacific coast to the Great Plains and central Texas.

The nearest described observation is a 1999 sighting from Don Pedro Reservoir (Tuolumne County), 75 miles east of the Los Vaqueros Watershed (CDFG, 2008). However, based on this species' geographic range, which is described as much of California, it cannot be ruled out from the project area. However, the likelihood that it may roost in trees and rocky outcrops in the watershed is low.

Due to the lack of suitable structural habitat in study areas outside the watershed, this species is not expected in these areas.

Yuma Myotis Bat (*Myotis yumanensis*). Yuma myotis bats are usually associated with permanent sources of water, but also with natural water catchment basins in the arid West (WBWG, 2005). They occur in a variety of habitats including riparian, arid scrublands, deserts, and forests. Occasionally roosting in mines or caves, these bats are most often found in buildings or bridges. Bachelors also sometimes roost in abandoned cliff swallow nests, but tree cavities were probably the original sites for most nursery roosts.

The nearest described observation is a 2003 sighting in the City of Pleasanton (Alameda County), 12 miles southwest of the Los Vaqueros Watershed (CDFG, 2008). Based on this species' described range, which is much of California, it cannot be ruled out from the project area. However, the likelihood that it may roost in trees and rocky outcrops in the watershed is low.

Due to the lack of suitable structural habitat in study areas outside the watershed, this species is not expected in these areas.

San Joaquin pocket mouse (*Perognathus inornatus inornatus*). The San Joaquin pocket mouse lives in dense annual grasslands, saltbush scrub, and oak savannah habitats, exploiting the topography of flat ground and low hills. It is usually found in areas with friable soils, constructing its small burrows in sandy soil near bases of bushes. Microhabitats include dense grass, dirt roadsides, and rock outcroppings. Sparse iodine bush scrub and short grasslands habitat in the

Western powerline alignment provide the best available habitat in the project area for this species, and provides the only described local occurrence of this species (CDFG, 2008).

Grasslands with friable soils on the Transfer-Bethany Pipeline and at the Western substation site provide high quality habitat where this species could occur. Non-native annual grasslands throughout the project area provide potential, though lesser quality habitat.

American Badger (*Taxidea taxus*). In California, American badgers occupy a diversity of habitats. Grasslands, savannas, and mountain meadows near the timberline are preferred, though they can be found in deserts as well. The principal requirements seem to be sufficient food, friable soils, and relatively open, uncultivated ground.

In California, badgers range throughout the state, except for the humid coastal forests of northwestern California in Del Norte County and the northwestern portion of Humboldt County (Williams, 1986). This species is expected to occur in low densities in grassland habitats throughout the project area, with populations identified in the Los Vaqueros Reservoir footprint and just north of the existing reservoir (Jones and Stokes, 1988; ESA, 2004).

American badgers may be encountered on the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline, and at other in-watershed and out-of-watershed facilities. Grasslands on the Western powerline alignment, Western substation site, and PG&E facilities site may also support this species.

Plants

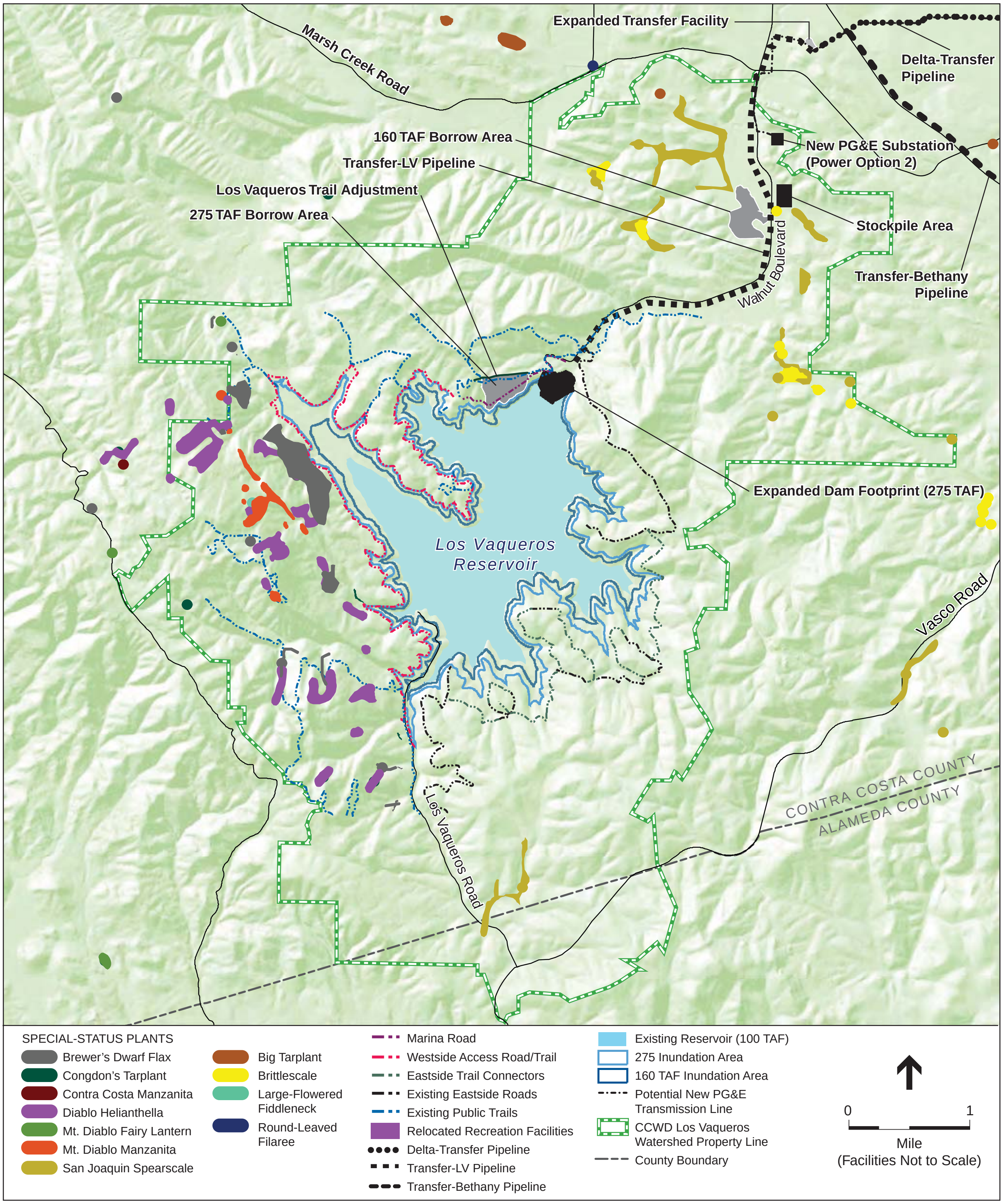
Figures 4.6-12 and **4.6-13** show the known distribution of special-status plants within the watershed and outside the watershed, respectively.

Federal or State Threatened and Endangered Species

Contra Costa Goldfields. Contra Costa goldfields is a small spring annual in the sunflower family (Asteraceae). Habitat for this species occurs in vernal pools, swales and moist flats within alkaline playas, valley and foothill grasslands, and cismontane woodland below a 1,500-foot elevation (CNPS, 2008). The species is often found in association with other endemic vernal pool plants such as coyote thistle, smooth goldfields (*Lasthenia glaberrima*), flatface downingia (*Downingia pulchella*), and common mousetail (CDFG, 2008).

Historically, Contra Costa goldfields were known from the north coast, the southern Sacramento Valley, the San Francisco Bay Area, and the southern coast. Currently, it is known to occur in Mendocino, Napa, Marin, Contra Costa, Alameda, Solano, Sonoma, and Monterey Counties, and is believed to be extirpated from Santa Barbara and Santa Clara Counties (CNPS, 2008). CDFG (2008) reports four occurrences in Contra Costa County and four in Alameda County.

No occurrences of Contra Costa goldfields are known within the watershed, with the nearest occurrence reported 11 miles north of Los Vaqueros Dam (CDFG, 2008). Based on protocol-level survey findings, this species is not expected to occur in the study area for any proposed facilities.



SOURCE: USGS, 1993 (base map); CNDD , 2007; and ESA, 2007

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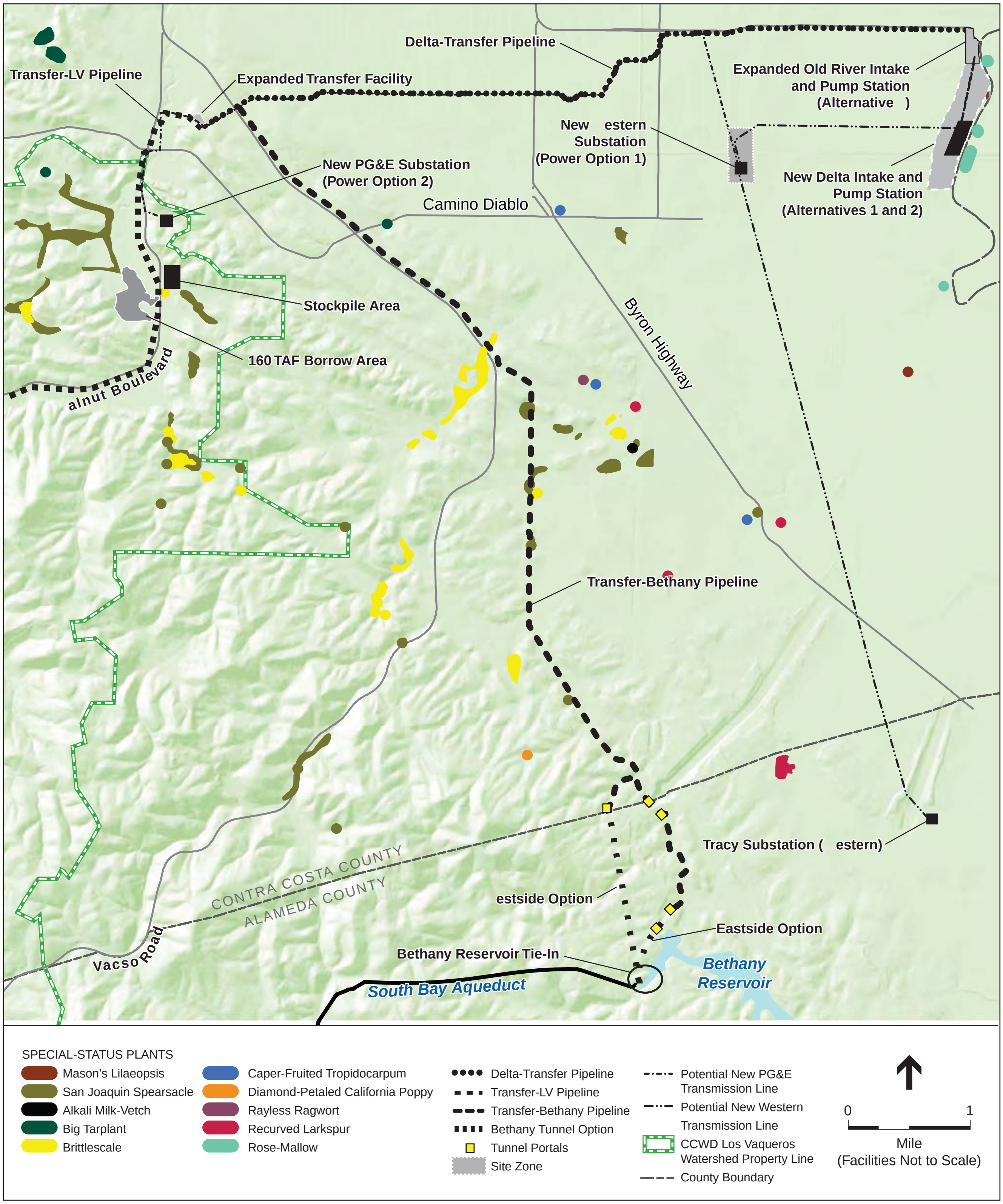
Figure 4.6-12
Distribution of Special Status Plants in the Los Vaqueros Watershed



SOURCE: USGS, 1993 (base map); and ESA, 2007

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Figure 4.6-1
Distribution of Special Status Plants Alon
Pipeline Routes Outside of the
Los Vaqueros Watershed

Federal or State Species of Special Concern

Heartscale (*Atriplex cordulata*). Heartscale is a low-growing annual herb in the goosefoot family (*Chenopodiaceae*). It grows in sandy, saline, or alkaline flats or scalds, in chenopod scrub, meadows, and valley and foothill grassland at less than 1,230-foot elevations (CNPS, 2008). Heartscale often grows in association with other atriplex, saltgrass, alkali heath, and common tarweed (*Hemizonia pungens*) (CDFG, 2008). Like other *Atriplex* species, heartscale is relatively tolerant of disturbance.

Heartscale is known within the southern Sacramento Valley to the San Joaquin Valley. Its current distribution ranges from Glenn and Butte Counties in the north to Kern County in the south (CNPS, 2008). Two populations are recorded in the Livermore vicinity in Alameda County, though no occurrences are reported in Contra Costa or San Joaquin Counties (CDFG, 2008).

Potential habitat is only available at a few distinct sites on the Transfer-Bethany Pipeline alignment and at the Western substation site (Power Option 1), which is spanned by powerlines under Power Option 2, where final botanical surveys were delayed due to site access constraints. Based on the spring 2008 survey findings (ESA, 2008), which did not identify this species, and the species' described distribution, a low likelihood exists that this species may be encountered in this area. No other project facilities support this species.

Brittlescale (*Atriplex depressa*). Brittlescale is associated with alkaline or clay soils in chenopod scrub, playas, vernal pools, or seeps, and in valley grassland at less than 1,050-foot elevations (CNPS, 2008). It often occurs in the alkali soils of the Pescadero and Solano series (East County HPA, 2006).

Populations occur in semibarren areas of saline and alkaline meadows with other atriplex, alkali heath, salt grass, alkali mallow, meadow barley (*Hordeum brachyantherum*), common tarweed, and bush seepweed. Brittlescale is sometimes associated with other rare plants such as palmate-bracted bird's-beak and San Joaquin saltbush (CDFG, 2008).

Brittlescale is known within the southern end of the Sacramento Valley through the San Joaquin Valley. It is currently known within Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kern, Madera, Merced, Solano, Tulare, and Yolo Counties. The CNDDB has 52 known occurrences and all are presumed extant (CDFG, 2008). However, it is believed that some of these occurrences may be misidentified lesser saltscale (*Atriplex miniscula*) (East County HCPA, 2006). The distribution of this species in the project area is shown on Figure 4.6-12 and Figure 4.6-13.

Brittlescale has been recorded in the Los Vaqueros Watershed downstream from the Los Vaqueros Reservoir (CDFG, 2008). These three occurrences were found during surveys conducted in the watershed in 1988. About 500 plants were found 0.8 mile south of Marsh Creek Road, another 500 were observed about 0.6 mile north of Vasco Road, and 150 plants were found on the western side of the reservoir spillway south of Los Vaqueros Dam (Jones and Stokes, 1988).

Agricultural land and annual grassland in the study area for the Delta Intake Facilities, Delta-Transfer Pipeline, Transfer-LV Pipeline, and Expanded Transfer Facility do not provide habitat for this species. Alkali wetlands and alkali grasslands within in the Transfer-Bethany Pipeline study area provide suitable habitat for brittlescale. Alkali wetlands and alkali grasslands east of Vasco Road and along Armstrong Road provide suitable habitat for this species. Initial spring 2008 surveys identified potential habitat in alkali grasslands at a few distinct locations on the Transfer-Bethany Pipeline alignment near Armstrong Road. Final botanical surveys of these areas were delayed in 2008 due to site access constraints, thus, there remains a moderate potential that several small brittlescale populations occur in this area.

San Joaquin Spearscale (*Atriplex joaquiniana*). San Joaquin spearscale is known within the eastern side of the southern inner Coast Ranges, the southern end of the Sacramento Valley, and the San Joaquin Valley. Historically, the species' range extended from Glenn County in the north to Tulare County in the south, but it is currently assumed to be extirpated from Santa Clara, San Joaquin, and Tulare Counties (CNPS, 2008).

This species is known to occur in alkali wetlands and along alkaline watercourses in the Los Vaqueros Watershed. The occurrences recorded from the lower Los Vaqueros Watershed, below the existing reservoir, include some of the largest recorded populations for this species (Jones and Stokes, 1988; ESA, 2007). The majority of in-watershed occurrences are along the Lower Los Vaqueros Watershed and within 1 to 2.5 miles of Los Vaqueros Dam (CDFG, 2008). No occurrences are recorded within the inundation zone; however, the stockpile area is just north of one population (CDFG, 2008). The distribution of this species in the project area is shown on Figures 4.6-12 and 4.6-13.

Based on focused survey findings (ESA, 2008b), San Joaquin spearscale is absent from the Delta Intake Facilities, Delta-Transfer Pipeline, Transfer-LV Pipeline, and Expanded Transfer Facility study areas. For the Transfer-Bethany Pipeline, several San Joaquin spearscale populations were identified in alkali wetlands and alkali grasslands south of Armstrong Road, in alkali grasslands habitats that were outside the pipeline study area (CDFG, 2008; ESA 2008b). Several populations were identified in the Western substation study area that can be avoided through appropriate siting of the substation within the study area (ESA, 2008b).

Brewer's Dwarf-Flax (western flax) (*Hesperolinon breweri*). Brewer's dwarf flax occurs on serpentine, sandstone, and volcanic soils in chaparral, woodlands, and valley foothill grasslands between 100- and 2,300-foot elevations (CNPS, 2008; East County HCPA, 2006). The species is generally found on slopes in areas with low-growing vegetation and in association with toyon, manzanita, chamise, foothill pine, buckbrush, scrub oak, sticky monkeyflower, yarrow, purple needlegrass, and slender wild oats (CDFG, 2008).

The species range is described as the Vaca Mountains at the southern end of the inner North Coast Range in Napa and Solano Counties and continuing into the Altamont Hills in Contra Costa County (Hickman, 1993). The distribution of this species in the project area is shown on Figure 4.6-13.

Six occurrences are reported in the watershed vicinity (see Figure 4.6-13). One occurrence was reported in the southern portion of Round Valley in 1987 with greater than 1,000 individuals. The other five occurrences were found during watershed surveys conducted in 1988. This species was observed during special-status plant surveys conducted for this project in six distinct populations totaling about 1,850 individuals (ESA, 2007). Population sizes range from 100 to 500 plants. One population is within the study area and two mapped populations within this occurrence are known to occur within 150 feet of the westside access road and may be directly impacted by implementation of this project component. Another, smaller population south of this population consists of about 200 plants, and is within the study area (ESA, 2007).

Brewer's dwarf-flax is not expected in study areas outside the watershed.

Rose-Mallow (*Hibiscus lasiocarpus*). Rose-mallow is a perennial, rhizomatous herb in the mallow family (Malvaceae). Habitat for this species occurs in freshwater wetlands and freshwater marshes in California and elsewhere in North America. This species range includes the northern and central Sacramento Valley. It is currently known from San Joaquin, Solano, Contra Costa, Sacramento, Sutter, Colusa, Glenn, and Butte Counties (CNPS, 2008). The distribution of this species in the project area is shown on Figure 4.6-12.

Habitat for this species in the project area only occurs on the banks of Old River, near the Delta Intake Facilities. Two plants occur within a 1-square-meter area roughly 1,400 feet north of the Delta Intake Facilities, a colony with fewer than 15 plants occurs 1,100 feet south of the facilities, and a single plant occurs across Old River (CDFG, 2008). These populations are outside the Expanded Old River Intake and Pump Station project area. A colony consisting of fewer than 15 plants occurs at the site for the new Delta Intake and Pump Station. No other populations are known or were identified during focused botanical surveys in spring 2008 (ESA, 2008b).

Mason's Lilaeopsis (*Lilaeopsis masonii*). Mason's lilaeopsis occurs on tidally influenced mudflats and mud-banks of sloughs and rivers, freshwater and brackish marsh, and riparian scrub. The species typically grows in saturated clay substrates that are inundated by tidal action or waves on a regular basis. Common associates of this species include bulrush, bugleweed (*Lycopus* spp.), marsh pennywort (*Hydrocotyle* spp.), rushes, spikerush, loosestrife (*Lythrum* spp.), dock (*Rumex* spp.), coyote thistle, willow, cattail, and horsetail (*Equisetum* spp.) (CDFG, 2008). It is often found in association with other special-status plants including Delta mudwort, Delta tule pea, and Suisun Marsh aster (*Aster lentus*) (CDFG, 2008).

Mason's lilaeopsis is distributed though the Sacramento-San Joaquin River Delta and sloughs, Suisun Marsh, and Lower Napa River. The local distribution of this plant outside the watershed is shown on Figure 4.6-12. Two small colonies were identified on the banks of Old River near the Delta Intake Facilities, 5,000 feet north and 1,200 feet south of Expanded Old River Intake and Pump Station. The south population is about 700 feet north of the new Delta Intake and Pump Station site. This species is considered absent from the project area (ESA, 2007; 2008b).

Existing Mitigation Commitments for Special-Status Species

This section presents mitigation commitments from the three USFWS BOs that were issued for the existing Los Vaqueros Reservoir to address project effects on San Joaquin kit fox, bald eagle, California red-legged frog, Alameda whipsnake, longhorn fairy shrimp, and vernal pool fairy shrimp.

USFWS FESA Biological Opinion for San Joaquin Kit Fox and Bald Eagle. Formal USFWS consultation on the effects of the existing Los Vaqueros Reservoir on the San Joaquin kit fox (federally endangered) and bald eagle (formerly federally threatened, now delisted; state endangered) resulted in a BO from USFWS (USFWS 1-1-92-F-48, September 3, 1993). The BO lists several terms and conditions that the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and CCWD must comply with. Measures that affect long-term management in the watershed include:

- "CCWD shall acquire and protect in perpetuity a total of 7,544 acres of habitat for San Joaquin kit fox, which includes 6,513 acres within the watershed and 1,031 acres in two separate mitigation areas outside the watershed (BO pg 23), depending upon final assessment of all impacts from the project." (Note that recreational impacts to San Joaquin kit fox habitat were lower than initially anticipated. As a result, the required amount of dedicated conservation easement became 5,837 acres. As of December 2008, 4,150 acres have been conveyed to CDFG and an additional 1,856 acres are proposed to be conveyed to CDFG (see **Figure 4.6-14**)). "The habitat will be managed by CCWD under a USFWS- and CDFG-approved habitat management plan. This acreage amounts to a 3:1 mitigation ratio (compensation lands: impacted lands) for project impacts to San Joaquin kit fox habitat."

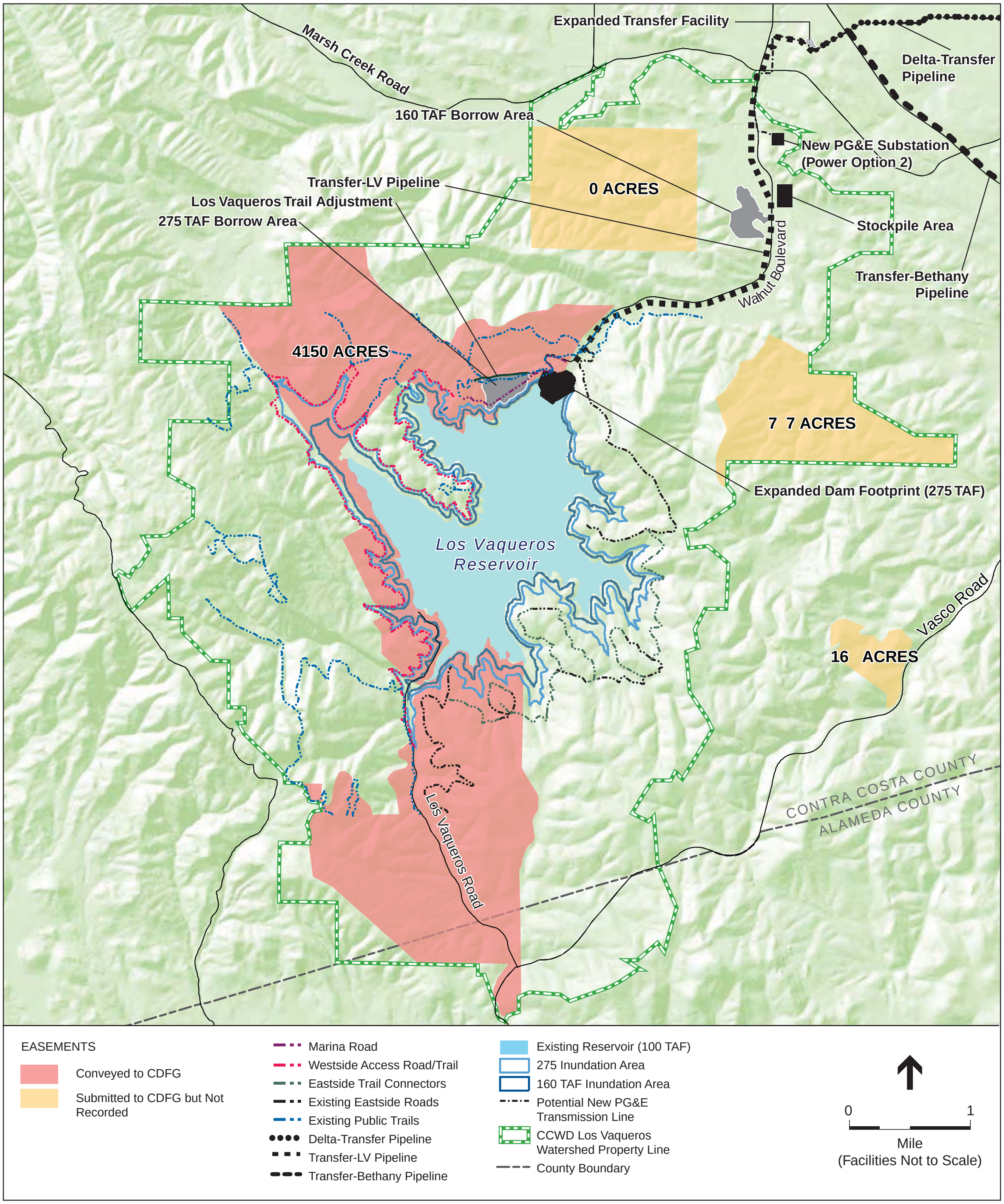
- "CCWD shall develop a recreation plan that addresses potential effects on San Joaquin kit fox and bald eagle in the watershed. USFWS and CDFG shall have approval authority over the plan to ensure that any potential effects on these species are reduced to an 'insignificant level.'"

- "CCWD shall monitor bald eagles in the watershed to help determine the effects of recreation on bald eagle use of the area and the mortality rates resulting from wind turbines in the project area. These effects shall be studied by CCWD using a USFWS- and CDFG-approved monitoring and study plan."

USFWS FESA Biological Opinion for California Red-Legged Frog and Alameda Whipsnake. Formal consultation concerning the effects of the existing Los Vaqueros Reservoir on the California red-legged frog (federally threatened) and a conference report on the effects on the Alameda whipsnake (federally threatened) resulted in a BO from USFWS (USFWS 1-1-96-F-151, November 8, 1996) (USFWS, 1996). As with the previous BO, this opinion lists several nondiscretionary terms and conditions that Reclamation and CCWD must comply with. Conditions that affect long-term management for these species in the watershed include the following:

- "CCWD shall monitor the extent and quality of California red-legged frog habitat to ensure that it does not decline over time. If any mitigation sites (ponds and wetlands) that were specifically created for California red-legged frog fail to support successfully reproducing California red-legged frogs for at least 1 year within the next 5 years from the date of this BO, the site shall be replaced at a 3:1 ratio."

- "Wetlands that are identified for California red-legged frog mitigation must maintain adequate water levels throughout the year to provide suitable California red-legged frog breeding habitat. Mitigation includes 12.21 acres of wetlands, 10.59 acres of riparian, and 11.23 acres of stock ponds."

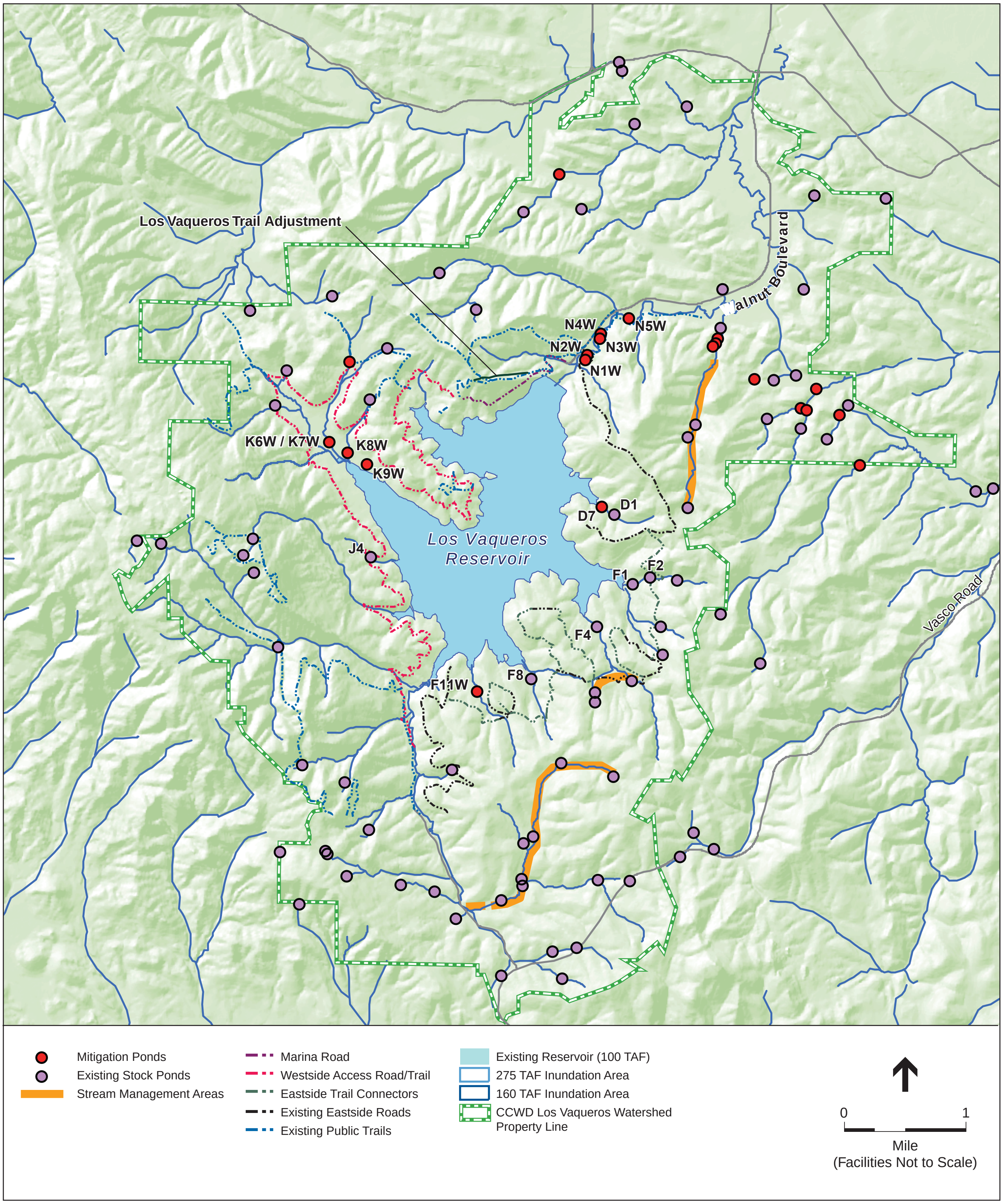


SOURCE: USGS, 1993 (base map); CNDD , 2007; and ESA, 2007

Figure 4.6-14
Location of San oaquin it Fox Easements ithin Los Vaqueros Watershed

- "Wetland and riparian habitats downstream of Los Vaqueros Dam site shall be monitored to ensure those areas are maintained as wetland habitats."
- "All alkali marsh mitigation wetlands shall be planted with bulrush at densities specified in the BO. The vegetation at these sites shall be monitored as they mature to ensure that they remain suitable for California red-legged frogs."
- "Monitor all stock ponds, created ponds, and semipermanent and alkali marsh mitigation wetlands in April, July, August, September, October, and once in winter of every year for water level, stage of California red-legged frog development, and presence of bullfrogs. Report the results of this monitoring effort by January 15 of every year of the project."
- "Livestock fencing in areas specified in the BO must be maintained in perpetuity to protect California red-legged frog habitat."
- "CCWD shall prepare and submit for approval to USFWS a Predator Management Plan for the project area. The plan will include measures to reduce or eliminate habitat for bullfrogs, monitoring for the presence of bullfrogs and their egg masses, dewatering stock ponds with bullfrogs, and success criteria."
- "Changes in land uses identified in the watershed management program and the resource management plan shall not occur without additional consultation with USFWS."
- "Visitor use shall be limited and pets shall be prohibited from Drainage Units D, E, F, and G. No recreational activities shall be allowed in the California red-legged frog mitigation sites (see **Figure 4.6-15** for mitigation site locations). See **Figure 4.6-16** for access restrictions in the watershed."
- "Mosquito abatement and the application of any herbicides or pesticides in the project area must be approved by USFWS."
- "No construction activities, public vehicle traffic (including trams), bikes, or recreational facilities shall be allowed within 500 feet of chaparral or scrub, excluding Old Vasco Road, which enters the reservoir site from the south."
- "No off-road travel within 500 feet of chaparral or scrub shall be allowed without prior approval by USFWS. See Figure 4.6-16 for access restrictions in the watershed."
- "Vehicle speed limits of 15 mph must be observed within 500 feet of Alameda whipsnake habitat."
- "No additional firebreaks will be constructed in chaparral without USFWS approval."

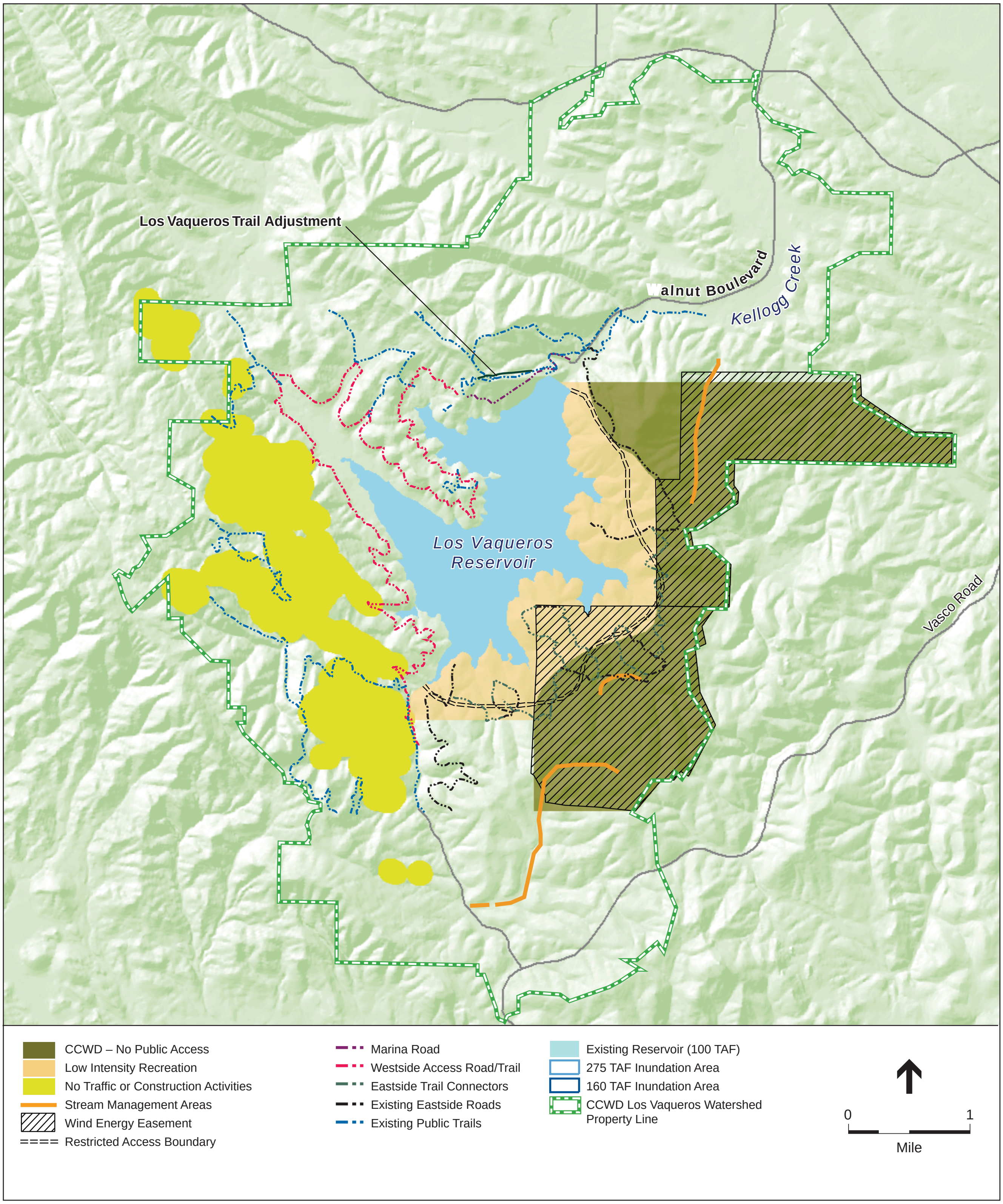
USFWS FESA Biological Opinion for Fairy Shrimp (Two Species). For the existing Los Vaqueros Reservoir, USFWS issued a conference report (USFWS, 1993b), clarification letter, and adoption of the Conference Opinion as a BO with modifications to terms and conditions (USFWS, 1995) for the longhorn fairy shrimp (*Branchinecta longiantenna*; federally endangered) and the vernal pool fairy shrimp (federally threatened).



SOURCE: USGS, 1993 (base map); and ESA, 2006

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-15
Location of Wetlands Created for
California Red Le ed Fro and
Stoc ponds ithin the Los Vaqueros Watershed



SOURCE: USGS, 1993 (base map); CCWD, 2007; and ESA, 2007

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-16
Existin Access Restrictions ithin the Los Vaqueros Watershed

These two species of federally listed invertebrates were originally addressed in a conference report by USFWS in 1993 when they were still proposed for listing. After the conference report was issued, both species were formally listed. Therefore, USFWS adopted the conference report into its BO in 1995 after modifying several terms and conditions. Measures that affect long-term management in the watershed include:

- "Human use in the easternmost portion of the Kellogg Creek watershed and in Conservation Area 1…shall be restricted to activities associated with wind energy generation, dry-land farming, grazing, and administration by CCWD. Public use shall be restricted to research and occasional educational activities conducted under the supervision of CCWD staff or other designated land management agencies. This use designation corresponds to the No-Use designation in the conceptual recreation plan. Lands just east of the reservoir will be managed by CCWD to allow low-intensity dispersed recreation use. The eastern boundary of the area shall be fenced to prevent human access to the more restricted easternmost lands and this fence and the Kellogg Creek vernal pools area shall be patrolled to ensure that no trespassing happens and that the fence remains intact. Accepted uses in the lands just east of the reservoir include hiking and boat landing, and associated activities such as picnicking. Except as may be provided under Term and Condition 1b, major facilities shall not be located in this area. This use designation corresponds to the Controlled-Use category in the conceptual recreation plan (USFWS, 1995)."

- "Several areas in the watershed shall be set aside from most human activities. These areas include the easternmost portion of the watershed and Conservation Area 1. (See Figure 4.6-16 for access restrictions in the watershed.) Lands just east of the reservoir shall only have low-intensity, dispersed recreation use. Excluded areas shall be fenced and patrolled to exclude public access."

- "The Kellogg Creek vernal pool complex and a 200-foot buffer are within lands for which a conservation easement has been granted to CDFG."

Stage II EIS/EIR – Golden Eagle Monitoring Requirements. Compliance with the federal MBTA, the Bald Eagle Protection Act, and mitigation measures adopted through the CEQA/NEPA process required CCWD to monitor nesting golden eagles. In addition, activities such as construction and recreation should avoid disturbing nesting golden eagles. To accomplish this avoidance, CCWD seasonally closes and reroutes recreation trails that pass within 0.5 mile of nesting golden eagle sites and halts watershed operations in the vicinity of active nests.

Existing Conservation Commitments

CDFG CESA Memorandum of Understanding for San Joaquin Kit Fox. CDFG and CCWD signed a CESA memorandum of understanding for the existing Los Vaqueros Reservoir on February 16, 1994, which outlines several conservation measures that were included in the BO for this species. Measures include acquiring the conservation areas mentioned previously for this species and legally conveying the easements to CDFG, monitoring of kit fox habitat, and several construction-related measures. Other measures include prohibiting the widespread use of rodenticides in the watershed.

Sensitive Habitats

Sensitive habitats include vegetation communities and wetlands that are regulated by resource agencies or are identified in local or regional plans and policies. Sensitive habitats in the study area include oak woodlands, riparian vegetation, emergent marsh, vernal pools, and alkali meadows. Sensitive natural communities in the project area include saline emergent marshlands (alkali meadow, alkali seep, and cismontane alkali marsh), freshwater marsh, northern claypan vernal pool, and valley needlegrass grassland. These sensitive habitats are discussed in Appendix D.

Stage II EIR/EIS and USFWS Fish and Wildlife Coordination Act Report – Oak Woodland Monitoring Requirements. As required for water reclamation projects by the mitigation adopted during the CEQA/NEPA process and the Fish and Wildlife Coordination Act, a *Fish and Wildlife Coordination Act Report and Final Recommendations* were prepared by USFWS for the existing Los Vaqueros Reservoir. As part of the report, USFWS prepared and submitted a valley oak and blue oak savanna mitigation plan to CCWD that addressed the mitigation requirements of both the CEQA/NEPA and Fish and Wildlife Coordination Act processes. The plan requires the creation or enhancement of a total of 394 acres of valley oak woodland and savanna and between 16 and 67 acres of blue oak woodland (Fish and Wildlife Coordination Act requirement only). A range for blue oak mitigation was established to address the range of potential impact anticipated for the recreation facilities plan that was still in development at the time. Development of the maximum recreation facilities concept requires up to 67 acres of blue oak mitigation.

USACE Section 404 Permit – Wetlands. For the existing Los Vaqueros Reservoir, impacts on wetlands and other waters of the United States regulated under CWA, Section 404, were authorized under an individual permit (Permit No. 199000070) from USACE. Wetlands created for mitigation must meet the Section 404 permit performance standards for both vegetation and hydrology. Mitigation is considered successful if, after 6 years of monitoring, about 80 percent of each wetland type has met USACE's criteria for vegetation and hydrology performance. Wetland creation and enhancement requirements are presented for each wetland type in **Table 4.6-5**.

TABLE 4.6-5
SUMMARY OF ORIGINAL LOS VAQUEROS PROJECT IMPACTS TO WATERS OF THE UNITED STATES AND REQUIRED MITIGATION

Wetland Type	Impacts (Acres)	Mitigation Commitment (Acres)	Mitigation Commitment (Type)
Alkali marsh	2.06	4.12	creation
Semipermanent marsh	3.64	7.33	creation
Vernal pool	0.01	0.02	creation
Willow-cottonwood riparian	0.38	0.76	creation
Seasonal wetlands	N/A	6.48	creation
Alkali grassland and meadow	3.23	30.50	enhancement
Total	**9.32**	**49.21**	

SOURCE: USACE, Section 404 Permit 1990-0070.

4.6.2 Environmental Consequences

Methodology

The impact analysis for biological resources was based on consideration of the following:

- Construction activities and the expected maximum area of ground disturbance
- Long-term operations and the associated area of potential effect
- Existing habitat conditions
- Known or presumed occurrence of sensitive habitats and protected species within or near proposed alternative sites

As defined in **Table 4.6-6**, the following terms are used in this analysis to distinguish areas of potential direct impact from areas of potential indirect impact: "project area" or "project site" refers to the area of potential direct effects that could be physically modified by proposed facilities or activities; "project study area" refers to the area where biological resources were evaluated outside of the proposed facility site boundaries, but where potential indirect effects could occur.

TABLE 4.6-6
DEFINITION OF PROJECT AREA AND PROJECT STUDY AREA

Project Component	Project Area (Surveyed for Direct Project Impacts)	Project Study Area (Area Surveyed to Assess Indirect Project Impacts)
Expanded Reservoir	Maximum extent of surface water inundation, plus 25-feet	A 1,000-foot buffer was physically surveyed for biological resources; the Los Vaqueros Watershed and surrounding watersheds were analyzed to assess regional impacts to special status wildlife species
Facilities within Los Vaqueros Watershed	Footprint of proposed facilities	150-foot buffer surrounding facilities was physically surveyed; the Los Vaqueros Watershed and surrounding watersheds were analyzed to assess regional impacts to special status wildlife species
New Delta Intake and Pump Station and Power Supply Infrastructure	Footprint of proposed facilities	A 150-foot buffer surrounding facilities was physically surveyed; areas up to 1.0 mile were assessed for special status wildlife species
Pipelines	200-foot-wide easement for the Delta-Transfer Pipeline and Transfer-LV Pipeline; 300-foot wide easement for the Transfer-Bethany Pipeline	500-foot wide corridor centered on the alignment was physically surveyed; areas up to 1.0 mile were assessed for special status wildlife species

SOURCE: ESA, 2008

The evaluation of project impacts on special status plant and wildlife species was based either on known population locations or an assessment of habitat that would be affected. Impacts to special-status species were assessed in terms of potential changes in the amount and distribution of suitable habitat, the relative importance of the affected habitats, and the potential for direct loss of individuals. The distribution of special status plant and wildlife species that may occur in the project study area, as identified in Table 4.6-4, is organized by project component in **Table 4.6-7**.

Habitat disturbance impacts were defined as temporary or permanent. A temporary impact generally lasts less than one growing season. To better distinguish long-term impacts from permanent impacts, the category of "long-term temporary impact," is used for western pond turtle and San Joaquin kit fox. This term is used in this section to describe temporary habitat disturbances with a duration lasting longer than one growing season. Permanent impacts, as used in this section, are those that would permanently alter the landscape with no return to pre-project conditions. USFWS generally considers "long-term temporary" effects (i.e., effects with a duration of greater than one growing season) as permanent effects.

Habitat Compensation

The habitat mitigation and compensation ratios presented in this section were derived based on guidance provided in the Multi-Species Conservation Strategy (MSCS) (CALFED, 2000) and input provided during ongoing strategic planning meetings with CDFG and USFWS staff from 2004 to 2008. A summary of habitat compensation ratios relevant to this analysis is provided in Section 4.6.3, and represents both low and high habitat compensation ratios.

The baseline habitat value of impacted lands within the watershed was evaluated using USFWS' Habitat Evaluation Procedure (HEP), which will also be used to establish HEP values for replacement lands. Thus, while mitigation values are presented as a range for selected special-status species and sensitive habitats, final habitat compensation values (e.g., whether temporary impacts to San Joaquin kit fox habitat are mitigated at a 1:1 or 3:1 ratio [compensation lands: impacted lands]) will be determined by how well replacement lands approximate impacted habitat values, and if lower quality habitat can be successfully restored. Higher mitigation ratios are appropriate if mitigation lands are deemed only partially suitable or require some degree of enhancement to balance HEP habitat values.

The MSCS ratios are considered initial guidelines; the permitting agencies will determine project requirements on a case-by-case basis. However, the MSCS compensation ratios provide guidance on the appropriate nature and magnitude of compensation needed to adequately mitigate species- and habitat-based impacts.

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in CEQA Guidelines, Appendix G. These thresholds also encompass the factors taken into account under NEPA to assess an impact in terms of its context and intensity.

An alternative would result in a significant impact on terrestrial biological resources if it would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFG or USFWS

TABLE 4.6-7
SPECIAL-STATUS SPECIES WITH POTENTIAL TO BE AFFECTED, SORTED BY PROJECT FACILITY

Special-Status Species	Status: Fed/State/ CNPS/ CALFED	Potential Species Occurrence in Project Study Area									NCCP Habitat Associations
		275-TAF/ 160-TAF Inundation Zone	Watershed/ Recreation Facilities	Transfer - Los Vaqueros Pipeline	Transfer Station	Delta-Transfer Pipeline	Transfer-Bethany Pipeline	Delta Intake Facilities	Power Option 1	Power Option 2	
Invertebrates											
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES											
Branchinecta longiantenna Longhorn fairy shrimp	FE/--/--/m	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	NSW
*Branchinecta lynch*i Vernal pool fairy shrimp	FT/--/--/m	Unlikely	Unlikely	Unlikely	Unlikely	Potential	Known	Unlikely	Potential	Unlikely	NSW
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	FT/--/--/R	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	VFR, Gr, US, VFW, UC
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN											
Branchinecta mesovallensis Midvalley fairy shrimp	--/--/--/--	Unlikely	Unlikely	Unlikely	Unlikely	Potential	Potential	Unlikely	Unlikely	Unlikely	NSW
Hygrotus curvipes Curved-foot hygrotus diving beetle	FSC/--/--/--	Potential	Potential	Potential	Unlikely	Unlikely	Potential	Unlikely	Potential	Unlikely	NSW
Amphibians											
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES											
Ambystoma californiense California tiger salamander	FT/CSC/--/m	Known	Known	Known	Potential	Unlikely	Potential	Unlikely	Unlikely	Potential	NFE, NSW, VFR, Gr, VFW
Rana draytonii California red-legged frog	FT/CSC/--/m	Known	Known	Known	Potential	Unlikely	Potential	Unlikely	Unlikely	Unlikely	NFE, VFR, Gr, VFW
Reptiles											
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES											
Masticophis laterals euryxanthus Alameda whipsnake (=Alameda striped racer)	FT/ST/--/m	Known	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	VFR, Gr, US, VFW

TABLE 4.6-7 (Continued)
SPECIAL-STATUS SPECIES WITH POTENTIALTO BE AFFECTED, SORTED BY PROJECT FACILITY

Special-Status Species	Status: Fed/State/ CNPS/ CALFED	Potential Species Occurrence in Project Study Area									NCCP Habitat Associations
		275-TAF/ 160-TAF Inundation Zone	Watershed/ Recreation Facilities	Transfer - Los Vaqueros Pipeline	Transfer Station	Delta-Transfer Pipeline	Transfer-Bethany Pipeline	Delta Intake Facilities	Power Option 1	Power Option 2	
Reptiles (cont.)											
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN (cont.)											
Actinemys marmorata Western pond turtle	--/CSC/--/m	Known	Known	Known	Unlikely	Potential	Potential	Potential	Potential	Unlikely	La, NFE, VFR, Gr, US, VFW
Masticophis flagellum ruddocki San Joaquin whipsnake (=coachwhip)	--/CSC/--/m	Known	Potential	Potential	Unlikely	Potential	Potential	Unlikely	Potential	Unlikely	Gr, US, VFW
Phrynosoma coronatum Coast horned lizard	--/CSC/--/--	Potential	Potential	Potential	Unlikely	Potential	Potential	Unlikely	Potential	Unlikely	VFR, US, VFW
Birds											
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES											
Buteo swainsoni Swainson's hawk	--/ST/--	Potential	Unlikely	Known	Unlikely	Potential	Potential	Unlikely	Unlikely	Unlikely	VFR, Gr, UC, VFW, NSW, US
Haliaeetus leucocephalus Bald eagle	BEPA-FD/SE-CFP/--/m	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	La, NFE, VFR, VFW
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN											
Accipiter cooperi Cooper's hawk	--/CSC/--/m	Potential	Potential	Potential	Unlikely	Unlikely	Potential	Unlikely	Unlikely	Unlikely	VFR, VFW
Accipiter striatus Sharp-shinned hawk	--/CSC/--/--	Potential	Potential	Potential	Unlikely	Unlikely	Potential	Unlikely	Unlikely	Unlikely	VFR, VFW
Agelaius tricolor Tricolored blackbird	--/CSC/--/m	Potential	Potential	Potential	Unlikely	Potential	Potential	Unlikely	Potential	Potential	NFE, VFR, Gr, UC
Aquila chrysaetos Golden eagle	BEPA/CSC-CFP/--/m	Known	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Gr, US, VFW
Athene cunicularia hypugea Western burrowing owl	--/CSC/--/m	Known	Known	Known	Potential	Potential	Known	Potential	Potential	Potential	Gr, UC
Asio flammeus Short-eared owl	--/CSC/--/--	Potential	Unlikely	Potential	Potential	Potential	Potential	Unlikely	Potential	Potential	Gr, UC

TABLE 4.6-7 (Continued)
SPECIAL-STATUS SPECIES WITH POTENTIALTO BE AFFECTED, SORTED BY PROJECT FACILITY

Special-Status Species	Status: Fed/State/ CNPS/ CALFED	Potential Species Occurrence in Project Study Area									NCCP Habitat Associations
		275-TAF/ 160-TAF Inundation Zone	Watershed/ Recreation Facilities	Transfer - Los Vaqueros Pipeline	Transfer Station	Delta-Transfer Pipeline	Transfer-Bethany Pipeline	Delta Intake Facilities	Power Option 1	Power Option 2	
Birds (cont.)											
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN (cont.)											
Circus cyaneus Northern harrier	--/CSC/--/m	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Potential	NFE, NSW, Gr, UC
Elanus leucurus White-tailed (=black shouldered) kite (nesting)	--/CFP/--/m	Potential	Potential	Potential	Unlikely	Potential	Potential	Unlikely	Unlikely	Unlikely	VFR, Gr, UC
Eremophila alpestris actica California horned lark	--/CSC/--/--	Potential	Potential	Potential	Unlikely	Potential	Potential	Unlikely	Potential	Potential	Gr, UC
Falco mexicanus Prairie falcon (nesting)	--/CSC/--/--	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Gr, US
Lanius ludovicianus Loggerhead shrike	--/CSC/--/--	Potential	Potential	Potential	Unlikely	Potential	Potential	Unlikely	Potential	Potential	VFR, Gr, US, VFW
Pandion haliaetus Osprey	--/CSC/--/m	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	La, VFR
Mammals											
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES											
Vulpes macrotis mutica San Joaquin kit fox	FE/ST/--/m	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Gr, US, VFW
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN											
Antrozous pallidus Pallid Bat	--/CSC/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Corynorhinus townsendii Townsend's big-eared bat	--/CSC/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Eumops perotis californicus Greater western mastiff bat	FSC/CSC/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Myotis ciliolabrum Small-footed myotis bat	FSC/--/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A

TABLE 4.6-7 (Continued)
SPECIAL-STATUS SPECIES WITH POTENTIALTO BE AFFECTED, SORTED BY PROJECT FACILITY

Special-Status Species	Status: Fed/State/ CNPS/ CALFED	Potential Species Occurrence in Project Study Area									NCCP Habitat Associations
		275-TAF/ 160-TAF Inundation Zone	Watershed/ Recreation Facilities	Transfer - Los Vaqueros Pipeline	Transfer Station	Delta-Transfer Pipeline	Transfer-Bethany Pipeline	Delta Intake Facilities	Power Option 1	Power Option 2	
Mammals (cont.)											
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN (cont.)											
Myotis evotis Long-eared myotis bat	FSC/--/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Myotis thysanodes Fringed myotis bat	FSC/--/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Myotis volans Long-legged myotis bat	FSC/--/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Myotis yumanensis Yuma myotis bat	FSC/CSC/--/--	Potential	Potential	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	N/A
Perognathus inornatus inornatus San Joaquin pocket mouse	--/CSC/--/--	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Potential	Gr (alkali)
Taxidea taxus American badger	--/CSC/--/--	Known	Potential	Potential	Potential	Potential	Potential	Unlikely	Potential	Potential	Gr
Plants											
FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES											
Lasthenia conjugens Contra Costa goldfields	FE/--/1B/m	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	NSW
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN											
Atriplex cordulata Heartscale	--/--/1B/--	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Potential	Unlikely	Unlikely	Unlikely	NSW, Gr
Atriplex depressa Brittlescale	--/--/1B/m	Unlikely	Known	Unlikely	Unlikely	Unlikely	Potential	Unlikely	Unlikely	Unlikely	NSW, Gr
Atriplex joaquiniana San Joaquin spearscale	--/--/1B/m	Unlikely	Known	Unlikely	Unlikely	Unlikely	Known	Unlikely	Known	Known	NSW, Gr
Hesperolinon breweri Brewer's dwarf-flax (=western flax)	--/--/1B/m	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Gr, US, VFW

TABLE 4.6-7 (Continued)
SPECIAL-STATUS SPECIES WITH POTENTIALTO BE AFFECTED, SORTED BY PROJECT FACILITY

Special-Status Species	Status: Fed/State/ CNPS/ CALFED	Potential Species Occurrence in Project Study Area: 275-TAF/ 160-TAF Inundation Zone	Watershed/ Recreation Facilities	Transfer - Los Vaqueros Pipeline	Transfer Station	Delta-Transfer Pipeline	Transfer-Bethany Pipeline	Delta Intake Facilities	Power Option 1	Power Option 2	NCCP Habitat Associations
Plants (cont.)											
FEDERAL OR STATE SPECIES OF SPECIAL CONCERN (cont.)											
Hibiscus lasiocarpus Rose-mallow	--/--/2/m	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Known	Unlikely	Unlikely	NFE
Lilaeopsis masonii Mason's lilaeopsis	--/SR/1B	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Known	Unlikely	Unlikely	TFE

* **Key to Potential Species Occurrence in Project Study Area: Known =** Species with known distribution in the study area; **Potential** = Species with potential to occur in the study area based on species' range and the presence of potentially suitable habitat; **Unlikely** = Species is unlikely to occur based on focused survey findings and/or lack of suitable habitat. Species not observed during appropriately timed focused surveys and considered absent from project study area.

TAF = thousand acre-feet

STATUS CODES:

Federal (U.S. Fish and Wildlife Service):
BEPA = Bald Eagle Protection Act
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FSC (Former) Federal Species of Special Concern (list is no longer maintained)
FC = Candidate for Federal listing

State (California Department of Fish and Game):
SE = Listed as Endangered by the State of California
ST = Listed as Threatened by the State of California
SR = Listed as Rare by the State of California (plants only)
CSC = California species of special concern
CFP = California fully protected species

California Native Plant Society (CNPS):
List 1A = Plants believed extinct
List 1B = Plants rare, threatened, or endangered in California and elsewhere
List 2 = Plants rare, threatened, or endangered in California but more common elsewhere
List 3 = Plants about which more information is needed
List 4 = Plants of limited distribution

CALFED: (CALFED Bay-Delta Program Multi-Species Conservation Strategy [MSCS] Species Goals)
R = Recovery. Recover species' populations within the MSCS focus area to levels that ensure the species' long-term survival in nature.
r = Contribute to recovery. Implement some of the actions deemed necessary to recover species' populations within the MSCS focus area.
m = Maintain. Ensure that any adverse effects on the species that could be tied to implementation of CALFED actions will be fully offset through implementation of actions beneficial to the species.

Natural Community Conservation Plan Habitat Type:
Gr = Grassland
La = Lacustrine
NFE = Nontidal Freshwater Emergent
NSW = Natural Seasonal Wetland
SE = Saline Emergent
TFE = Tidal Freshwater Emergent
UC = Upland Cropland
US = Upland Scrub
VFR = Valley/Foothill Riparian
VFW = Valley/Foothill Woodland Forest

SOURCES: CNPS, 2008; CDFG, 2008; ESA, 2007

- Have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by CDFG or USFWS
- Have a substantial adverse effect on federally protected wetlands as defined by CWA Section 404 (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means
- Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory native wildlife corridors, or impede the use of wildlife nursery sites
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan

Impact Summary

Table 4.6-8 provides a summary of the impact analysis for biological resources issues based on proposed actions outlined in Chapter 3.

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Implementation of this alternative would neither temporarily nor permanently affect wetlands or other waters of the United States, special status species or their habitat, or sensitive plant communities. Movement corridors and nursery sites for wildlife would remain unchanged. The No Project/No Action Alternative would not conflict with any policies protecting biological resources or approved HCPs or NCCPs, nor degrade the quality of the environment.

Construction

Impact 4.6.1: Project construction would affect the following NCCP habitat types (CDFG sensitive plant communities in parentheses): Natural Seasonal Wetland (i.e., bulrush-cattail series, northern claypan vernal pool, bush seepweed and saltgrass series), Valley/Foothill Riparian (i.e., Fremont cottonwood series and valley oak series), Grassland (i.e., purple needlegrass series), and Valley/Foothill Woodland Forest (i.e., blue oak series). (Less than Significant with Mitigation)

Sensitive plant communities in the project study area are shown on **Figure 4.6-17**, **Figure 4.6-18**, and **Figure 4.6-19**. Project impacts, organized by facility and alternative, are presented in **Table 4.6-9**.

TABLE 4.6-8
SUMMARY OF IMPACTS – BIOLOGICAL RESOURCES

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.6.1: Project construction would affect the following NCCP habitat types (CDFG sensitive plant communities in parentheses): Natural Seasonal Wetland (i.e., bulrush-cattail series, northern claypan vernal pool, bush seepweed and saltgrass series), Valley/Foothill Riparian (i.e., Fremont cottonwood series and valley oak series), Grassland (i.e., purple needlegrass series) and Valley/Foothill Woodland Forest (i.e., blue oak series).	LSM	LSM	LSM	LSM
4.6.2: Project construction could affect potentially jurisdictional wetlands or waters, and streambeds and banks regulated by CDFG.	LSM	LSM	LSM	LSM
4.6.3: Project construction could affect populations of special-status plant species including brittlescale, San Joaquin spearscale, Brewer's dwarf-flax, and rose-mallow.	LSM	LSM	LSM	NI
4.6.4: Project construction would result in impacts on California red-legged frog and California tiger salamander, including aquatic breeding habitat and upland aestivation habitat for these species.	LSM	LSM	LSM	LSM
4.6.5: Project construction would result in direct and indirect impacts on existing populations of and habitat for the western pond turtle.	LSM	LSM	LSM	LSM
4.6.6: Project construction under Alternatives 1, 2, and 3 would result in direct and indirect impacts on listed vernal pool fairy shrimp and their habitat, and on the non-listed midvalley fairy shrimp and curved-foot hygrotus diving beetle.	LSM	LSM	LSM	NI
4.6.7: Project construction would have temporary and permanent impacts on potential San Joaquin kit fox habitat and permanently reduce potential regional movement opportunities in one location for this species.	LSM/SU	LSM/SU	LSM/SU	LSM/SU
4.6.8: Project construction would result in temporary and permanent loss of habitat for burrowing owls.	LSM	LSM	LSM	LSM
4.6.9: Project construction and operation activities would result in direct and indirect impacts on existing populations of and habitat for the golden eagle, bald eagle, and Swainson's hawk.	LSM B (bald eagle)	LSM B (bald eagle)	LSM B (bald eagle)	LSM B (bald eagle)
4.6.10: Project construction and increased reservoir water levels would result in temporary and permanent loss of potential and occupied habitat for Alameda whipsnake.	LSM	LSM	LSM	LSM
4.6.11: Project construction activities could result in direct and indirect impacts on the valley elderberry longhorn beetle and its habitat.	LSM	LSM	LSM	LSM
4.6.12: Project construction activities could affect active breeding bird nest sites and new powerlines could affect migratory birds.	LSM	LSM	LSM	LSM
4.6.13: Project construction activities under Alternatives 1 and 2 could affect designated critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields).	LSM	LSM	NI	NI
4.6.14: Project construction activities could affect nonlisted special-status reptile species (San Joaquin coachwhip and coast horned lizard).	LSM	LSM	LSM	LSM
4.6.15: Project construction activities could affect nonlisted special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse).	LSM	LSM	LSM	LSM

TABLE 4.6-8 (Continued)
SUMMARY OF IMPACTS – BIOLOGICAL RESOURCES

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.6.16: Draining the reservoir during project construction under Alternatives 1, 2, and 3 could affect Pacific Flyway species, including waterfowl and shorebirds.	LS	LS	LS	NI
4.6.17: The project would not result in conflicts with local and regional conservation plans, or local plans or ordinances protecting biological resources.	NI	NI	NI	NI
4.6.18: Project construction would not make a cumulatively considerable contribution to cumulative effects on special-status species and habitats.	LS	LS	LS	LS

SU = Significant and Unavoidable
LSM = Less-Than-Significant Impact with Mitigation
LS = Less-Than-Significant Impact
NI = No Impact
B = Beneficial Impact

CDFG = California Department of Fish and Game
NCCP = Natural Community Conservation Plan

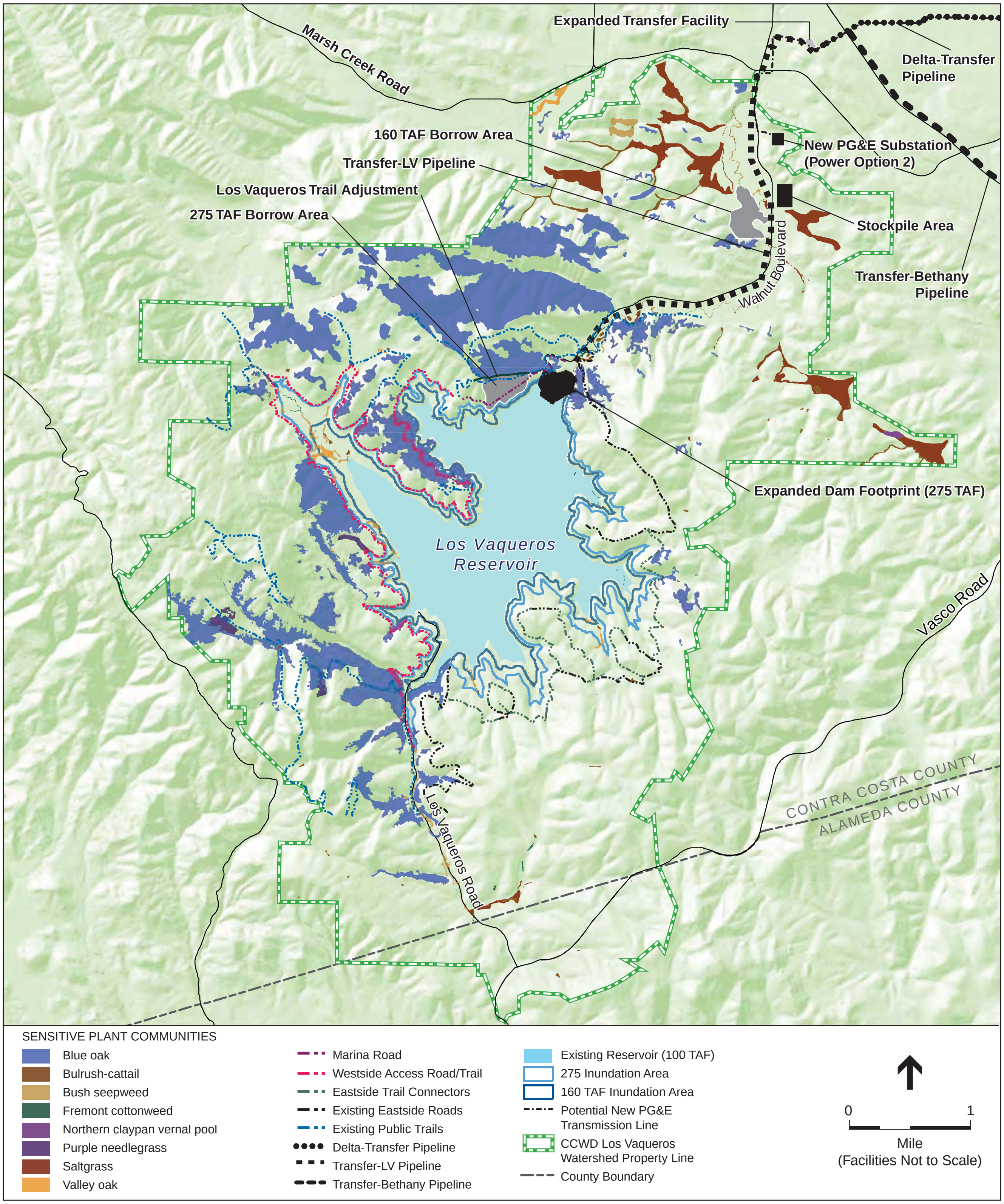
Alternative 1

Los Vaqueros Reservoir Expansion (including appurtenant facilities) and Recreational Facilities

The reservoir expansion and construction of other facilities in the watershed, including appurtenant facilities, access roads, and Recreation Facilities (referred to in this section as other in-watershed facilities), have the potential to result in losses to the following sensitive plant communities: bulrush-cattail series, saltgrass series, Fremont cottonwood series, valley oak series, purple needlegrass series, and blue oak series.

As shown in Table 4.6-9, about 2.5 acres of cattail-bulrush habitat would be permanently affected by dam construction. About 0.08 acre of saltgrass series (alkali marsh) habitat would be permanently impacted in the 275-TAF inundation zone in stock ponds and stream channels north and east of the reservoir.

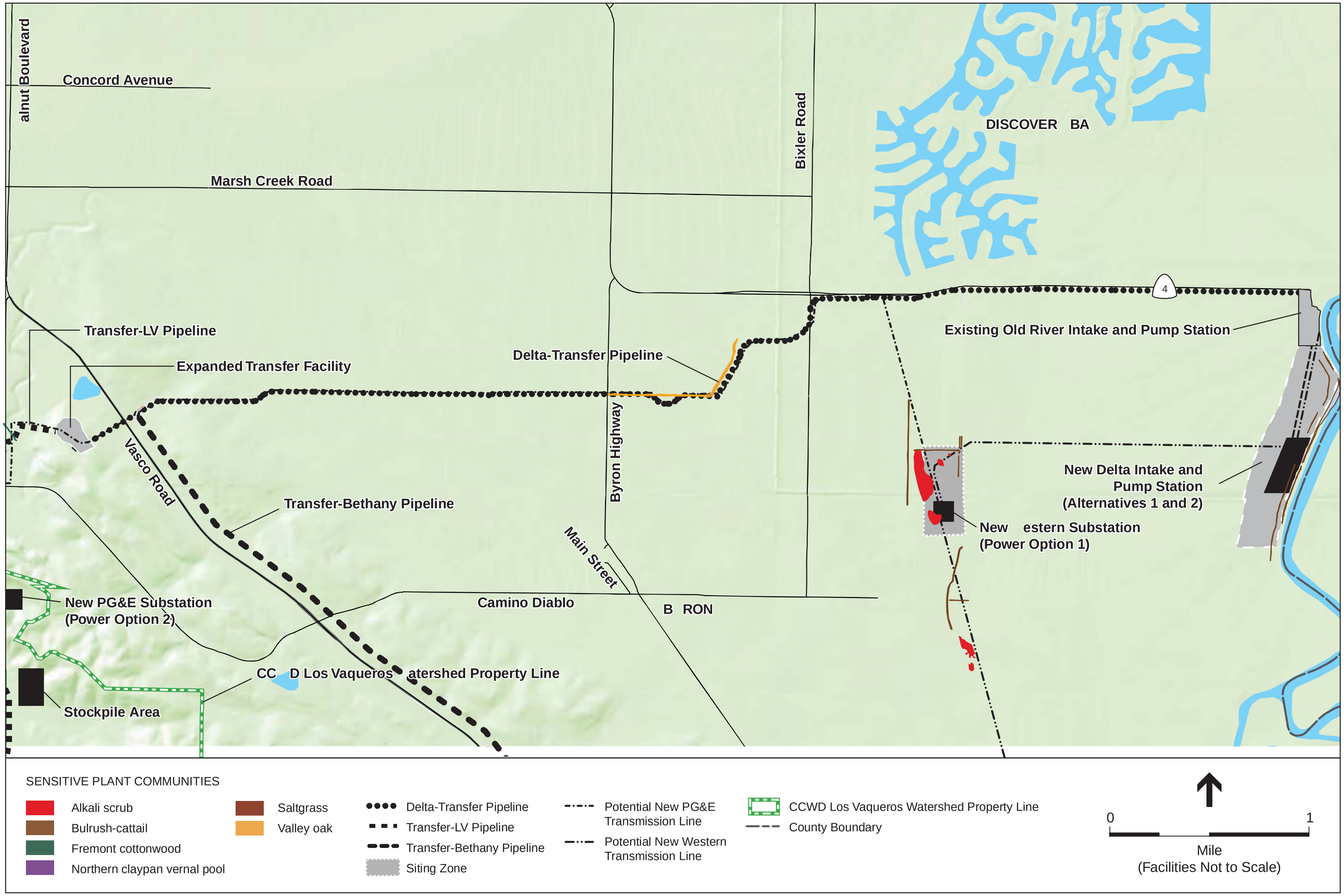
Reservoir expansion to 275 TAF would inundate and permanently eliminate 0.94 acre of Fremont cottonwood habitat. An additional 0.07 acre of cottonwood habitat could be directly affected during construction of the westside access road (0.05 acre) and eastside trail (0.02 acre) (Table 4.6-9). During construction the reservoir would be drained and flows to Kellogg Creek would be bypassed around the dam at a flow rate of about 5 cubic feet per second. The downstream reach of Kellogg Creek would receive bypassed flows during the construction period and would also continue to receive flows from the lower watershed during this period. Downstream releases are specifically intended to maintain habitat quality within the Kellogg Creek riparian corridor and maintain the health of cottonwood woodlands and bulrush/cattail habitat downstream of the dam.



SOURCE: USGS, 1993 (base map); CNDD , 2007; and ESA, 2007

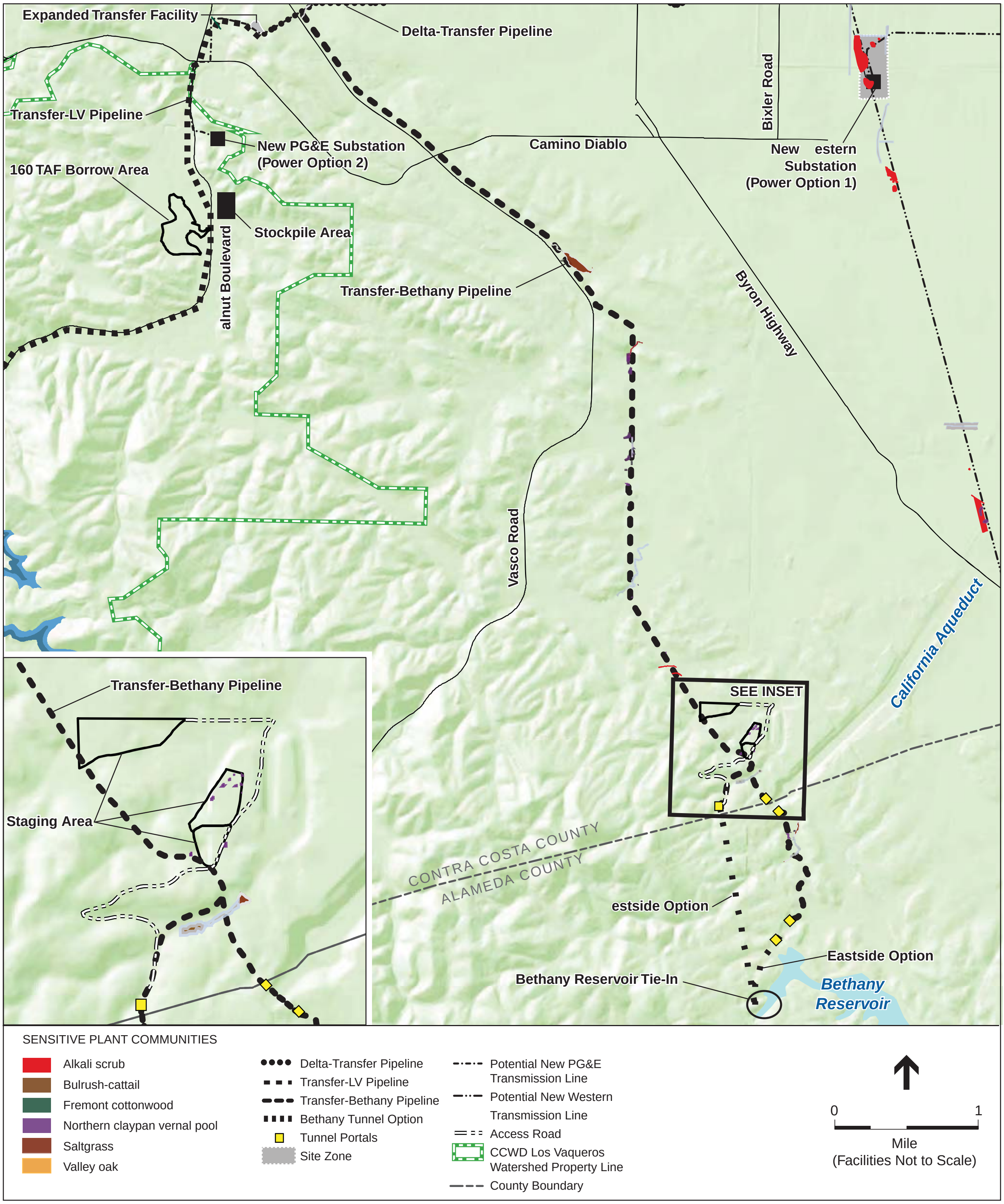
Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-17
Potential Direct Impacts to Sensitive Plant Communities in the Los Vaqueros Watershed



SOURCE: USGS, 1993 (base map); and ESA, 2008

Figure 4.6-1
Potential Direct Impacts to Sensitive Plant Communities in the Vicinit of the Delta Inta e and Pump Station Facilities and Alon the Delta Transfer Pipeline



SOURCE: USGS, 1993; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-1
Potential Direct Impacts to Sensitive Plant Communities in the Vicinit of the Transfer ethan Pipeline and Western Transmission Line

TABLE 4.6-9
SENSITIVE PLANT COMMUNITY IMPACTS BY PROJECT COMPONENT (ACRES)[a]

	Alternatives 1 and 2			Alternative 3			Alternative 4		
Project Component	**Temporary**	**Permanent**	**Total**	**Temporary**	**Permanent**	**Total**	**Temporary**	**Permanent**	**Total**
In-Watershed Facilities									
Reservoir Inundation Footprint and Dam									
Blue oak series	0.00	68.61	68.61	0.00	68.61	68.61	0.00	17.55	17.55
Bulrush-cattail series	0.00	2.50	2.50	0.08	2.50	2.50	0.00	1.95	1.95
Fremont cottonwood series	0.00	0.94	0.94	0.00	0.94	0.94	0.00	0.00	0.00
Purple needlegrass series	0.00	0.34	0.34	0.00	0.34	0.34	0.00	0.00	0.00
Saltgrass series	0.00	0.08	0.08	0.00	0.08	0.08	0.00	0.08	0.08
Valley oak series	0.00	29.15	29.15	0.00	29.15	29.15	0.00	16.42	16.42
Valley oak mitigation plantings	0.00	128.03	128.03	0.00	128.03	128.03	0.00	128.03	128.03
Blue oak mitigation plantings	0.00	9.02	9.02	0.00	9.02	9.02	0.00	9.02	9.02
Subtotal	**0.00**	**238.67**	**238.67**	**0.08**	**238.67**	**238.67**	**0.00**	**173.04**	**173.04**
Other In-Watershed Facilities [b]									
Bush seepweed series	0.38	0.00	0.38	0.38	0.00	0.38	0.38	0.00	0.38
Blue oak series	5.73	18.79	24.53	5.73	18.79	24.53	3.25	11.84	15.09
Bulrush-cattail series	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09
Fremont cottonwood series	0.02	0.05	0.07	0.02	0.05	0.07	0.02	0.07	0.09
Purple needlegrass series	0.09	0.23	0.32	0.09	0.23	0.32	0.04	0.08	0.12
Valley oak series	0.31	0.64	0.95	0.31	0.64	0.95	0.43	0.94	1.37
Valley oak mitigation plantings	0.00	4.1	4.1	0.00	4.1	4.1	0.00	0.00	0.00
Subtotal	**6.53**	**19.71**	**26.25**	**6.53**	**19.71**	**26.25**	**4.12**	**13.02**	**17.14**
Delta Intake Facilities									
Bulrush-cattail series	0.08	0.22	0.30	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	**0.08**	**0.22**	**0.30**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Delta-Transfer Pipeline									
Saltgrass series	0.30	0.00	0.30	0.30	0.00	0.30	0.00	0.00	0.00
Valley oak series	1.63	0.00	1.63	1.63	0.00	1.63	0.00	0.00	0.00
Subtotal	**1.93**	**0.00**	**1.93**	**1.93**	**0.00**	**1.93**	0.00	0.00	0.00
Transfer-LV Pipeline									
Bulrush-cattail series	0.24	0.00	0.24	0.24	0.00	0.24	0.00	0.00	0.00
Fremont cottonwood series	0.11	0.00	0.11	0.11	0.00	0.11	0.00	0.00	0.00
Saltgrass series	0.22	0.00	0.22	0.22	0.00	0.22	0.00	0.00	0.00
Valley oak series	0.10	0.00	0.10	0.10	0.00	0.10	0.00	0.00	0.00
Subtotal	**0.67**	**0.00**	**0.67**	**0.67**	**0.00**	**0.67**	**0.00**	**0.00**	**0.00**
Transfer-Bethany Pipeline									
Bulrush-cattail series	0.23	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00
Bush seepweed	0.22	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00
Saltgrass series	0.95	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00
Northern claypan vernal pool	0.86	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal	**2.26**	**0.00**	**2.26**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Power Option 1[c]									
Northern claypan vernal pool	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bulrush-cattail series	<0.1	0.00	<0.1	<0.1	0.00	<0.1	0.00	0.00	0.00
Bush seepweed	0.0	0.00	0.0	0.0	0.00	0.0	0.00	0.00	0.00
Subtotal	**<0.1**	**0.00**	**<0.1**	**<0.1**	**0.00**	**<0.1**	**0.00**	**0.00**	**0.00**

TABLE 4.6-9 (Continued)
SENSITIVE PLANT COMMUNITY IMPACTS BY PROJECT COMPONENT (ACRES)[a]

	Alternatives 1 and 2			Alternative 3			Alternative 4		
Project Component	**Temporary**	**Permanent**	**Total**	**Temporary**	**Permanent**	**Total**	**Temporary**	**Permanent**	**Total**
Power Option 2 [c]									
Northern claypan vernal pool	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bulrush-cattail series	<0.1	0.00	<0.1	<0.1	0.00	<0.1	0.00	0.00	0.00
Bush seepweed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fremont cottonwood	**<0.1**	0.00	**<0.1**	**<0.1**	0.00	**<0.1**	0.00	0.00	0.00
Subtotal									
Total Impacts to Sensitive Habitats									
Bush seepweed series	6.73	1.32	8.05	6.50	1.32	7.82	0.38	0.00	0.38
Blue oak series	5.73	87.40	93.14	5.73	87.40	93.14	3.25	29.39	32.64
Bulrush-cattail series	1.40	2.72	4.11	1.40	2.72	4.11	0.00	2.03	2.03
Fremont cottonwood series	0.18	0.99	1.18	0.18	0.99	1.18	0.02	0.07	0.09
Northern claypan vernal pool	0.93	0.00	0.93	0.07	0.0	0.07	0.00	0.00	0.00
Purple needlegrass series	0.09	0.56	0.66	0.09	0.56	0.66	0.04	0.08	0.12
Saltgrass series	1.48	0.08	1.56	0.52	0.08	0.60	0.00	0.08	0.80
Valley oak series	2.03	29.79	31.83	2.04	29.79	31.83	0.43	17.36	17.79
Valley oak mitigation plantings	0.00	132.13	132.13	0.00	132.13	132.13	0.00	132.13	132.13
Blue oak mitigation plantings	0.00	9.02	9.02	0.00	9.02	9.02	0.00	9.02	9.02

* Notes:

a “Temporary” impacts, as used in this analysis, include habitats that would be degraded or similarly impaired, with features being restored *in situ* to emulate pre-project conditions. “Permanent” impacts are those that would permanently destroy features, with compensatory mitigation provided in alternate locations.

b Other in-watershed facilities under Alternatives 1, 2, and 3 include the marina, marina access road, borrow area, picnic areas, trailhead parking, westside access road, eastside trail, stockpile area, and parking areas. Facilities under Alternative 4 include the above facilities, and 160-TAF borrow area.

c Note that plant community impacts for Power Supply Infrastructure do not include the acreage of features that will be avoided by facilities or spanned by powerlines.

SOURCE: ESA unpublished data, 2006-2008

About 29.15 acres of valley oak series habitat would be inundated and 0.95 acre could be affected by construction of the westside access road and other in-watershed facilities. About 68.61 acres of blue oak series would be affected by inundation, and another 5.73 acres would be temporarily and 18.79 acres permanently affected by construction of the other in-watershed facilities.

Reservoir expansion would permanently flood about 0.34 acre of purple needlegrass series habitat. For other in-watershed facilities, the westside access road would permanently affect 0.23 acre of this habitat and temporarily affect 0.09 acre. The permanent impact area for purple needlegrass habitat includes 0.06 acre that could be periodically affected by wave action along the shoreline during reservoir operations. This impact is considered permanent because it would periodically result in the degradation or removal of grassland throughout the lifetime of reservoir operations.

About 0.38 acre of bush seepweed habitat would also be temporarily affected by construction of in-watershed facilities.

In addition to the above impacts, prior onsite mitigation commitments for terrestrial oak woodland habitat would be removed by grading, dewatering, trenching, and other construction activities related to dam modification and/or permanently flooded due to reservoir expansion to 275 TAF. Permanent habitat losses would include the inundation of 125 acres of mitigation (i.e., planted) valley oak savannah, 3.03 acres of valley oak woodland, and 9.02 acres of blue oak woodland. Additionally, about 4.1 acres of mitigation valley oak savannah would be permanently lost to construction of the dam and associated Inlet/Outlet Pipelines.

Delta Intake and Pump Station

The new Delta Intake and Pump Station would permanently affect 0.22 acre of bulrush-cattail habitat and temporarily affect 0.08 acre on the banks of Old River.

Delta-Transfer Pipeline

Small, intermittent stands of saltgrass series habitat (0.30 acre total) are scattered throughout the Delta-Transfer Pipeline alignment (see Figure 4.6-17). Trenching and grading activities would temporarily disturb some areas. After construction is completed, disturbed areas would be restored to pre-project conditions.

Up to 1.63 acres of valley oak riparian vegetation along Kellogg Creek within this pipeline corridor could be temporarily disturbed during grading and trenching to install the pipeline, and restored after project completion. The existing easement is south of the creek, but some disturbance could occur if the construction corridor is constrained by other features.

Transfer-LV Pipeline

A limited amount of saltgrass series habitat (0.22 acre) in the watershed could be temporarily affected (see Figure 4.6-17) by trenching and grading activities. After construction, disturbed areas would be restored to pre-project conditions.

The pipeline intersection with Kellogg Creek, west of the Transfer Facility, could temporarily affect about 0.11 acre of Fremont cottonwood habitat, 0.24 acre of bulrush-cattail habitat, and 0.10 acre of valley oak habitat, which would be restored after project implementation.

Transfer-Bethany Pipeline

Roughly 0.23 acre of bulrush-cattail habitat could be temporarily affected along the Transfer-Bethany Pipeline crossings of Brushy Creek and other unnamed drainages along the corridor. Trenching and grading in the vicinity of these streams could also temporarily disturb up to 0.22 acre of bush seepweed vegetation as identified in Table 4.6-9. These areas would be restored after the project is completed.

Saltgrass series habitat (0.95 acre) is present within and right next to sections of this pipeline alignment. Project construction in the vicinity of this habitat could indirectly affect water quality in these features. Ground-disturbing activities such as trenching and grading, vegetation clearing, and construction materials storage could result in the direct loss of habitat and/or degradation of water quality. Seasonal wetlands would be restored wherever feasible, but it may not always be possible to restore all ponds on site; therefore, impacts could be permanent in limited areas.

Surveys identified 0.86 acre of northern claypan vernal pool habitat in the Transfer-Bethany Pipeline study area. For the purpose of this impact analysis it is presumed that this project component would temporarily affect up to 0.86 acre of northern claypan vernal pool habitat. These areas would be restored after the project is completed.

Power Supply Infrastructure

Power Option 1: Western Only. Under Option 1, the proposed 69-kilovolt double-circuit powerline alignment would traverse primarily agricultural areas in use for crops, irrigated pasturelands, and grazed annual grasslands. Several portions of the Western powerline alignment support Natural Seasonal Wetlands (bulrush-cattail, bush seepweed, northern claypan vernal pool) that would be spanned by powerlines. These areas are north and east of the Western substation siting zone (see Figure 4.6-18). Natural Seasonal Wetland habitat (bush seepweed) was also identified at the proposed Western substation site. Due to flexibility in facilities siting, the Western substation location would be sited within the study area to avoid and minimize impacts to sensitive plant communities.

It is expected that sensitive plant communities would be avoided by project design, largely by spanning Natural Seasonal Wetland habitats with powerlines. Although no sensitive plant community impacts are expected, Mitigation Measure 4.6.1b will be implemented to ensure that final siting plans consider, minimize, and avoid impacts to sensitive plant communities.

Power Option 2: Western and PG&E. As with Option 1, under this option the proposed 69-kilovolt double-circuit powerline alignment would traverse primarily agricultural areas in use for crops, irrigated pasturelands, and grazed annual grasslands, spanning Natural Seasonal Wetlands (bulrush-cattail, bush seepweed, northern claypan vernal pool). Because no sensitive plant communities exist in the area of the proposed PG&E substation or powerline (ESA, 2008b), no impacts would occur to sensitive plant communities.

Summary for Alternative 1

Under Alternative 1, the project would directly impact sensitive plant communities within and outside the Los Vaqueros Watershed, and affect mitigation plantings that compensated for impacts from the existing Los Vaqueros Reservoir. Blue oak woodlands and valley oak woodlands would see the greatest impacts by area; however, impacts would also be incurred to seasonal wetlands and native grassland habitat. These impacts would be significant prior to mitigation, but can be mitigated to a less-than-significant level through the incorporation of onsite and offsite mitigation. Mitigation Measure 4.6.1a seeks to avoid and minimize impacts to sensitive plant communities, and Mitigation Measure 4.6.1b provides compensation for impacts through habitat creation, enhancement, and preservation of affected sensitive plant communities.

As a component of Alternative 1, water flows in Kellogg Creek would bypass the dam construction site, thus, specific mitigation is not required to provide flows to maintain riparian habitat in Kellogg Creek.

Alternative 2

Potential impacts to sensitive plant communities under Alternative 2 would be the same as those discussed for Alternative 1 and are considered significant before the implementation of mitigation measures. Project impacts, organized by facility and alternative, are presented in Table 4.6-9.

Alternative 2-related impacts would be reduced to a less-than-significant level through the implementation of Mitigation Measures 4.6.1a and 4.6.1b.

Alternative 3

Alternative 3 would result in most of the same impacts described for Alternative 1, except that this alternative does not include construction of the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. Therefore, this alternative would impact 2.34 fewer acres of sensitive plant communities than Alternative 1.

Instead of the new Delta Intake and Pump Station, this alternative includes the Old River Intake and Pump Station Expansion. However, there would be no physical disruption either on land or in the Old River channel associated with expansion of this facility, and thus no additional impact to sensitive plant communities associated with this alternative.

Impacts to sensitive plant communities resulting from implementation of Alternative 3 would be significant prior to the implementation of mitigation measures. These impacts would be reduced to a less-than-significant level through the implementation of Mitigation Measures 4.6.1a and 4.6.1b.

Alternative 4

A 160-thousand-acre-feet (TAF) reservoir expansion and construction of in-watershed facilities would result in permanent losses to the same sensitive plant communities as Alternative 1 (except for Northern claypan vernal pool habitat), but to a reduced extent because of its reduced inundation area and elimination of new pipelines. Because the reservoir would not be fully drained for construction under this alternative, there would be no disruption of reservoir releases downstream to Kellogg Creek. Thus, providing water to this area through a bypass system would be unnecessary.

Permanent impacts to bulrush-cattail habitat plant communities would occur as a result of dam construction (1.95 acres) and other in-watershed facilities (0.09 acre). Saltgrass series habitat (0.08 acre) would be permanently affected in association with stock ponds and channels that would be inundated by reservoir expansion. About 16.42 acres and 17.55 acres of valley oak and blue oak series habitat, respectively, would be permanently impacted by reservoir expansion. Other in-watershed facilities could temporarily impact 0.43 acre of valley oak and permanently impact 0.94 acres. Also, 3.25 acres of blue oak could be temporarily impacted and 11.84 acres permanently impacted by in-watershed facilities under this alternative. Similar to the other alternatives, in-watershed facilities would temporarily impact 0.38 acre of bush seepweed series habitat. The westside access road and eastside trail for Alternative 4 would temporarily impact 0.02 acre and permanently impact 0.07 acre of Fremont cottonwood series habitat and the westside access road would impact 0.12 acre of purple needlegrass series habitat (0.04 acre temporary, 0.08 acre permanent).

Onsite mitigation commitments for terrestrial oak woodland habitat would also be impacted by reservoir expansion to 160 TAF. Permanent habitat losses would include the inundation of 125 acres of mitigation (i.e., planted) valley oak savannah, 3.03 acres of valley oak woodland, and 9.02 acres of blue oak woodland.

The 160-TAF borrow area does not support sensitive plant communities; thus, no impacts are anticipated from this project element.

Under Alternative 4, the project would have fewer permanent and temporary effects upon sensitive plant communities compared with Alternative 1, but impacts would remain significant prior to mitigation. Alternative 4 would have less impact upon valley oak and blue oak series habitat (17.79 acres and 32.64 acres for Alternative 4 versus 31.83 acres and 93.14 acres for Alternative 1, respectively), bulrush-cattail habitat (2.03 acres versus 4.11 acres), bush seepweed habitat (0.38 acre versus 8.05 acres), saltgrass series habitat (0.8 acre versus 1.6 acre), Fremont cottonwood series (0.09 acre versus 1.18 acre) and purple needlegrass series habitat (0.12 acre versus 0.66 acre). Impacts to oak mitigation plantings and commitments would be comparable under both alternatives. The implementation of Mitigation Measures 4.6.1a and 4.6.1b would reduce project impacts to a less-than-significant level.

Mitigation Measures

The distribution and extent of sensitive plant communities has been mapped and documented for all project facilities, both within and outside the watershed. Mitigation Measures 4.6.1a and 4.6.1b include sensitive resource avoidance, impact minimization, restoration of temporarily disturbed sensitive plant communities, and compensation for permanent, unavoidable losses through restoration, enhancement, creation, and preservation; implementation of these measures would reduce the impacts on sensitive plant communities from construction of all facilities to a less-than-significant level. Compensation measures presented in this section have been integrated into a comprehensive biological resources mitigation and compensation program, which is presented in Section 4.6.3.

Measure 4.6.1a: Based on the documented distribution of sensitive plant communities, CCWD shall implement avoidance and minimization measures to minimize impacts on sensitive plant communities during project construction. To the extent feasible, project design shall minimize impacts on sensitive plant communities. Exclusion and/or silt fencing shall be installed to buffer avoided areas.

Natural Seasonal Wetland habitat (bush seepweed) shall be avoided within the Western substation study area by siting facilities to avoid to this plant community.

Measure 4.6.1b: Where avoidance of sensitive plant communities is not possible, CCWD shall provide compensation through habitat creation, enhancement, and preservation, both within and outside the watershed, for temporary and permanent impacts on the following sensitive plant communities that will be affected by the project:

Natural Seasonal Wetland (Bulrush-cattail Series, Northern Claypan Vernal Pool, Bush Seepweed, and Saltgrass Series)

- CCWD shall implement Mitigation Measure 4.6.2, presented below, to minimize, and compensate for impacts to sensitive plant communities associated with jurisdictional wetlands and other waters of the United States.

Valley Oak, Blue Oak Woodlands, and Fremont Cottonwood Series

- CCWD shall develop an oak woodland mitigation and monitoring plan to outline mitigation and monitoring obligations for impacts resulting from increased reservoir levels and construction activities. This plan shall include restoration, enhancement, and/or preservation sites; thresholds of success; monitoring and reporting requirements; site-specific designs for site restoration/enhancement activities; and long-term maintenance activities as set forth in the following bullets.

- Under the oak woodland mitigation and monitoring plan, CCWD shall acquire or dedicate land suitable for blue oak woodland and riparian woodland (valley oak and Fremont cottonwood series) restoration, enhancement, and preservation. If restoration is feasible, then a ratio of at least 2:1 shall be used. If preservation (with enhancement) is used, at least a 3:1 ratio shall be implemented to offset losses.

- Due to the limited availability of suitable mitigation lands in the watershed, CCWD shall purchase blue oak mitigation lands outside of the watershed.

- CCWD shall coordinate acquisition of woodland mitigation lands with USFWS to minimize potential conflicts with regional San Joaquin kit fox planning efforts, which seek to maintain open grasslands movement corridors.

- CCWD shall submit the mitigation and monitoring plan to the appropriate regulatory agencies for approval.

Purple Needlegrass Grasslands

- CCWD shall seed disturbed areas within this habitat area with native grass seed collected within or in the vicinity of impacts. Additional seed could be used to supplement seed mixes, but seed shall be from locally collected (within the ecoregion) source material and shall be appropriately selected for site conditions.

- Consistent with MSCS guidance (CALFED, 2000) and coordination with CDFG and USFWS, mitigation for loss of this plant community shall be provided by preservation and enhancement of mitigation lands at a minimum of a 2:1 mitigation ratio to compensate for permanent losses.

- CCWD shall develop and implement a native grassland restoration and enhancement plan to identify potential seed collection sites, quantities of seed required, potential enhancement areas within the Los Vaqueros Watershed, potential enhancement activities, and other measures required to maintain the sustainability of native grassland restoration and enhancement areas.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.2: Project construction could affect potentially jurisdictional wetlands or waters, and streambeds and banks regulated by CDFG. (Less than Significant with Mitigation)

Before disturbing any jurisdictional water features, CCWD would obtain all required permit approvals from USACE, CDFG, Regional Water Quality Control Board (RWQCB), and all other agencies with permitting responsibilities for construction activities within jurisdictional waters.

Alternative 1

Wetlands and other waters of the United States or the State of California under regulatory jurisdiction of USACE, RWQCB, and/or CDFG occur in and near the study area (see **Table 4.6-10**; **Figure 4.6-20**, **Figure 4.6-21**, **Figure 4.6-22**, **Figure 4.6-23**). A discussion of potential impacts on sensitive aquatic habitat (e.g., Fremont cottonwood habitat) is provided above under Impact 4.6.1.

TABLE 4.6-10
WETLAND IMPACTS BY PROJECT COMPONENT

Project Component	Temporary Impacts*	Permanent Impacts	Total Impact to Section 404 Jurisdictional Area (Acres)
ALTERNATIVES 1 AND 2			
In-watershed Facilities			
Reservoir Inundation Footprint and Dam			
Nontidal Freshwater Permanent Emergent	0.0	2.50 (16 Features)	2.50
Natural Seasonal Wetland	0.0	1.79 (26 Features)	1.79
Valley/Foothill Riparian	0.0	0.24 (1 Feature)	0.24
Lacustrine (Pond)	0.0	1.23 (3 Features)	1.23
Subtotal	**0.0**	**5.76 (46 Features)**	**5.76**
Other In-watershed Facilities			
Nontidal Freshwater Permanent Emergent	0.02 (1 Feature)	0.04 (1 Feature)	0.06
Natural Seasonal Wetland	0.0	0.06 (3 Features)	0.06
Valley/Foothill Riparian	0.0	0.0	0.0
Lacustrine	0.0	0.02 (1 Feature)	0.02
Subtotal	**0.02**	**0.12**	**0.14**
In-watershed Total	**0.02**	**5.88**	**5.90**
New Delta Intake and Pump Station	0.50	0.29	0.79
Delta-Transfer Pipeline	2.97	0.0	2.97
Transfer-LV Pipeline	0.67	0.0	0.67
Transfer-Bethany Pipeline	3.03	0.86	3.89
Power Supply Infrastructure (Options 1 and 2)	<0.1	<0.1	<0.1
Prior Wetland Commitments			
Valley/Foothill Riparian	0.0	3.05	3.05
Freshwater Emergent Wetland	0.0	1.57	1.57
Total	**7.29**	**11.75**	**18.94**
ALTERNATIVE 3			
In-watershed Facilities (same as Alternative 1) **Subtotal**	**0.0**	**5.76 (46 Features)**	**5.76**
Other In-watershed Facilities (same as Alternative 1) Subtotal	**0.02**	**0.12**	**0.14**
Old River Intake and Pump Station Expansion	0.0	0	0
Delta-Transfer Pipeline	2.97	0.0	2.97
Transfer-LV Pipeline	0.67	0.0	0.67
Power Supply Infrastructure (Options 1 and 2)	<0.1	<0.1	<0.1
Prior Wetland Commitments			
Valley/Foothill Riparian	0.0	3.05	3.05
Freshwater Emergent Wetland	0.0	1.57	1.57
Total	**3.76**	**10.60**	**14.26**

TABLE 4.6-10 (Continued)
WETLAND IMPACTS BY PROJECT COMPONENT

Project Component	Temporary Impacts*	Permanent Impacts	Total Impact to Section 404 Jurisdictional Area (Acres)
ALTERNATIVE 4			
In-watershed Facilities			
Reservoir Inundation Footprint and Dam			
Nontidal Freshwater Permanent Emergent	0.0	1.95 (13 Features)	1.95
Natural Seasonal Wetland	0.0	0.71 (16 Features)	0.71
Lacustrine	0.0	0.82 (2 Features)	0.82
Subtotal	**0.0**	**3.48**	**3.48**
Other In-watershed Facilities			
Nontidal Freshwater Permanent Emergent	0.0	0.09	0.09
Natural Seasonal Wetland	0.03	0.05	0.08
Valley/Foothill Riparian	0.01	0.03	0.04
Lacustrine	0.0	0.0	0.0
Subtotal	**0.04**	**0.17**	**0.21**
Total	**0.04**	**3.65**	**3.69**

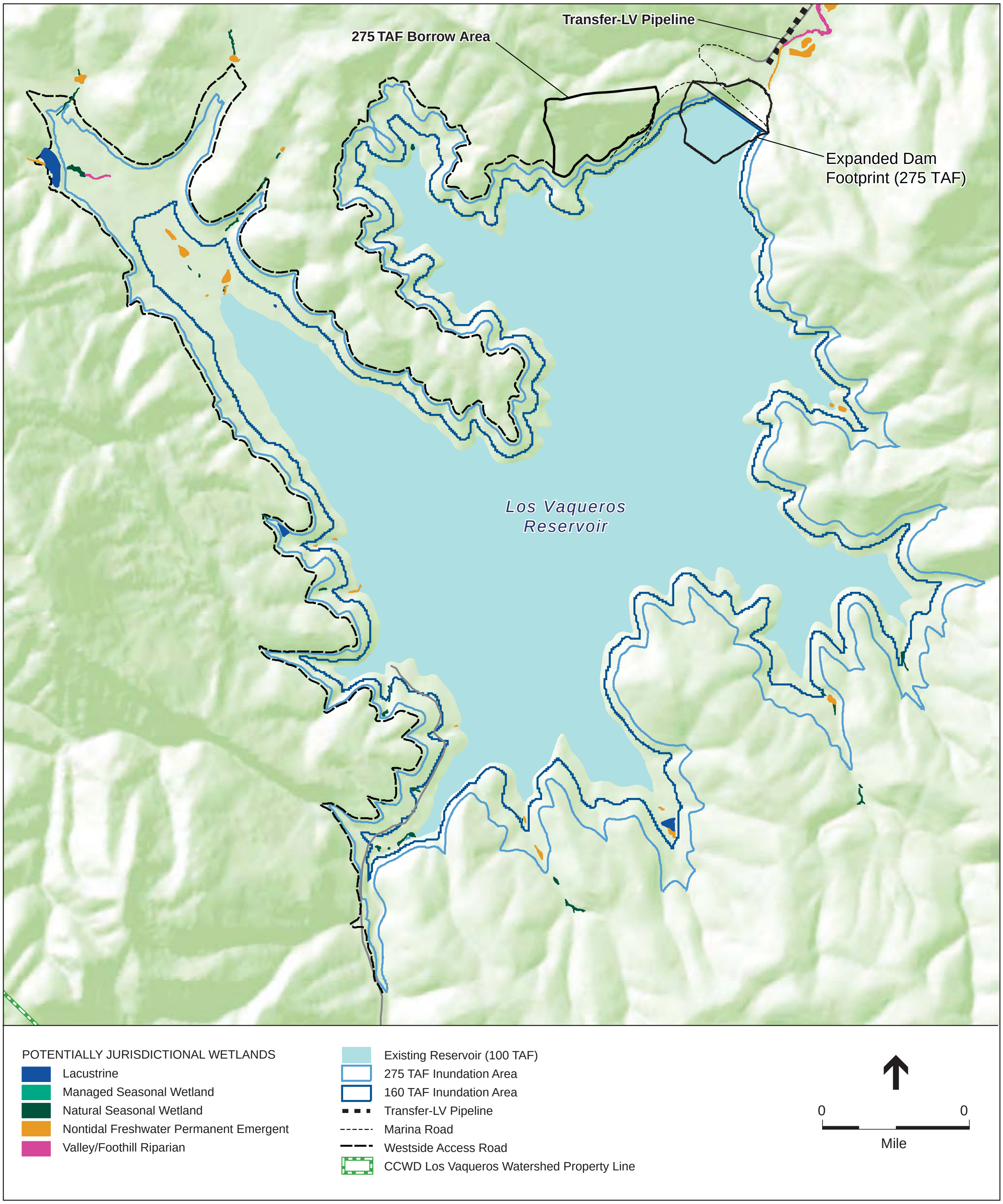
* "Temporary" impacts, as used in this wetlands analysis, include those that would partially or fully alter wetland features, with features being restored or recreated in situ to emulate pre-project conditions. "Permanent" impacts are those that would result in the permanent loss of wetland features with compensatory mitigation provided at alternate locations.

SOURCE: ESA unpublished data, 2006-2008

Los Vaqueros Reservoir Expansion, Other In-watershed Facilities, and Recreational Facilities

Potential jurisdictional features in the watershed study area include one perennial channel (Lower Kellogg Creek), nine intermittent channels (including Upper Kellogg Creek, Adobe Creek, Mallory Creek, Fig Pig Gulch, Savannah Creek, Buckeye Canyon, Horseshoe Creek, and several unnamed drainages), 123 ephemeral channels (including Lost Cave Creek, Mariposa Creek, and Silva Creek), 5 ponds, 56 permanent emergent wetlands, 51 natural seasonal wetlands, and 27 riparian wetlands. Results of the delineation identified a total of 57.4 acres of wetlands and "other waters" in the watershed study area.

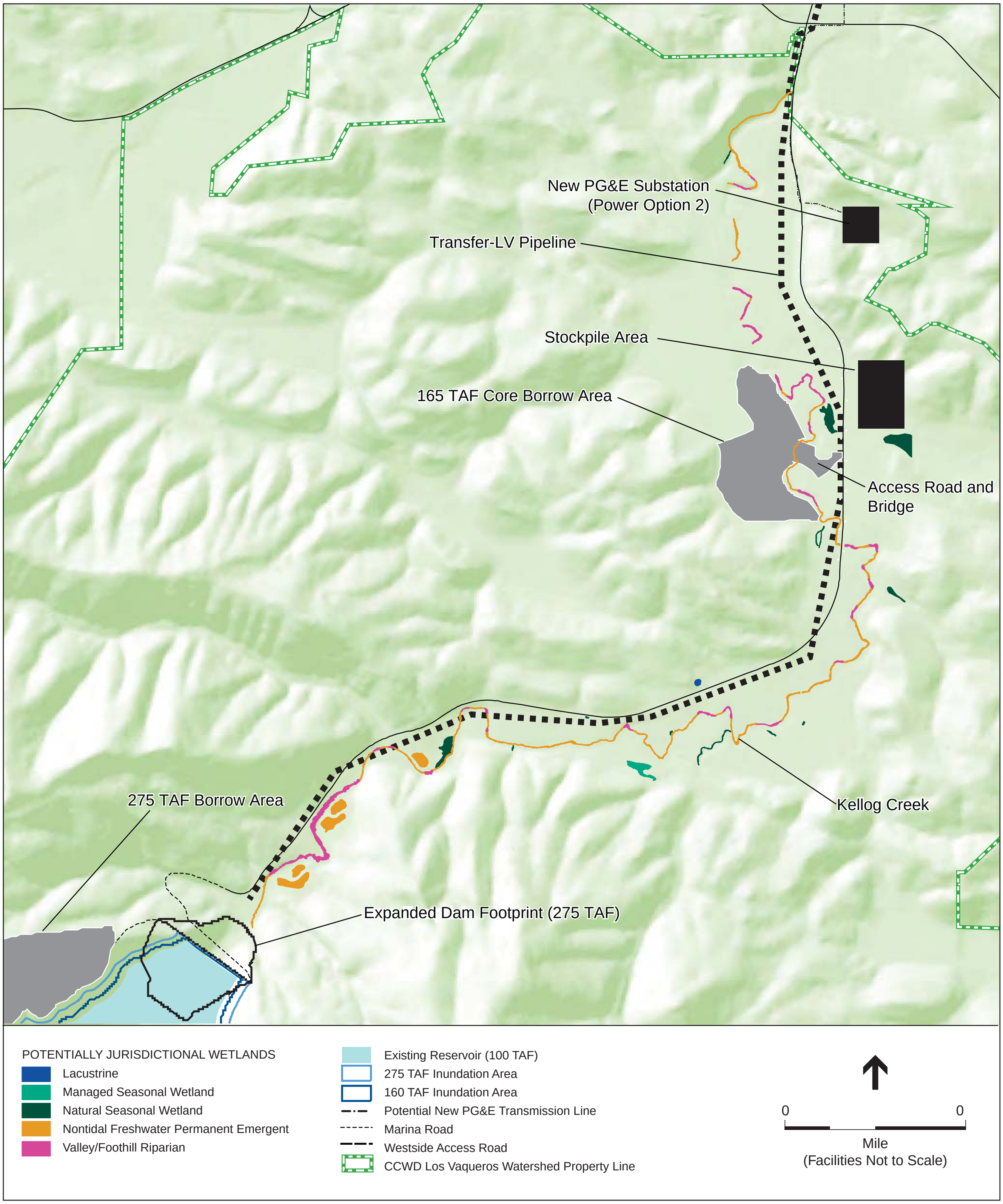
Expansion of the reservoir and construction of other in-watershed facilities would result in the permanent fill of 5.88 acres and temporary fill of 0.02 acre of potentially jurisdictional wetlands or other waters of the United States (Table 4.6-10; Figure 4.6-20 and Figure 4.6-21). "Temporary" impacts, as used in this wetlands analysis, include those that would partially or fully alter wetland features, with features being restored or recreated *in situ* to emulate pre-project conditions. "Permanent" impacts are those that would permanently inundate wetland features with compensatory mitigation provided in alternate locations.



SOURCE: USGS, 1993 (base map); ESRI, 2006; CCWD, 2007; CCC, 2007; MWH, 2007; and ESA, 2007

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

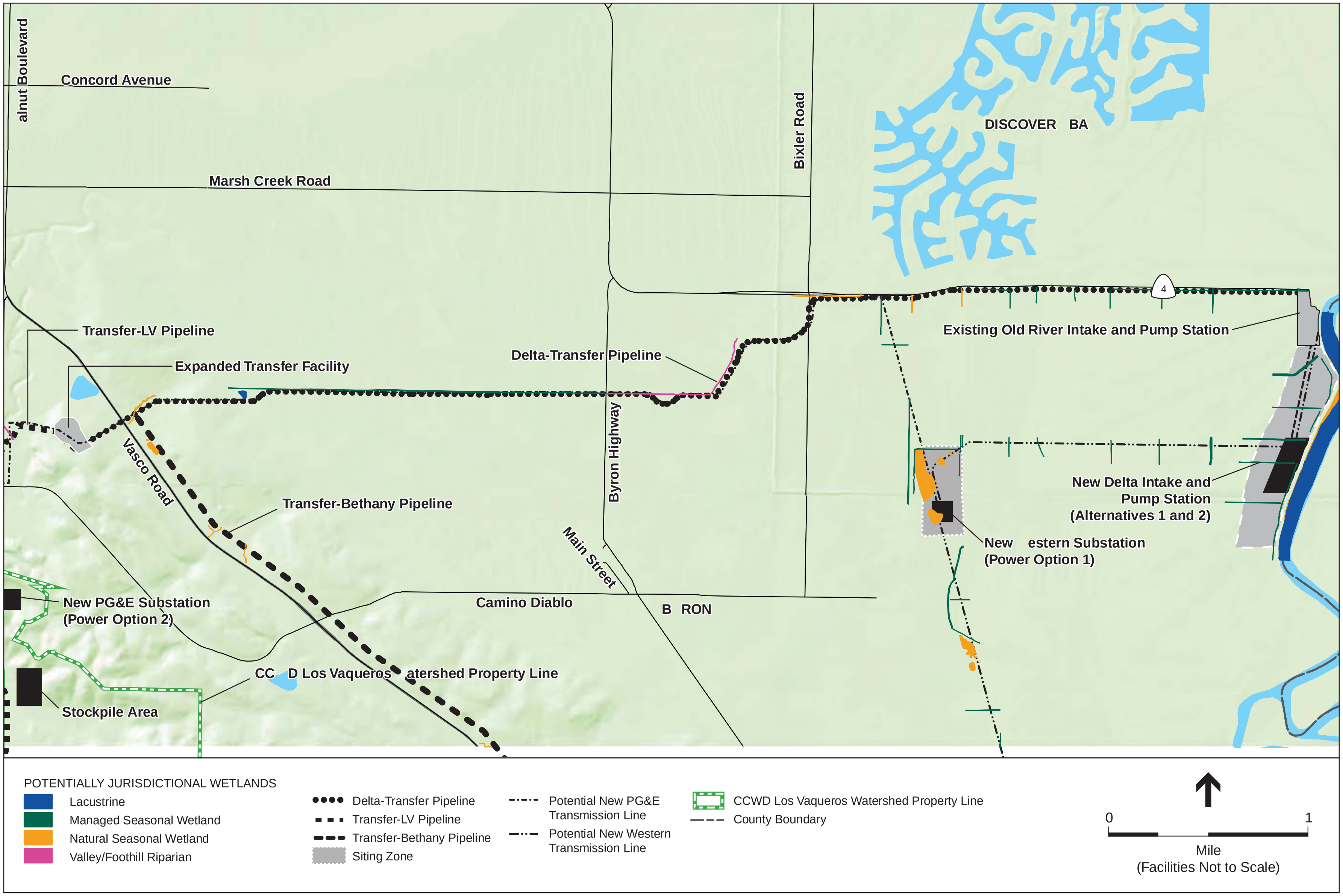
Figure 4.6-20
Potentiall urisdictional Wetlands in the Vicinit of the Los Vaqueros Reservoir



SOURCE: USGS, 1993 (base map); and ESA, 2007

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

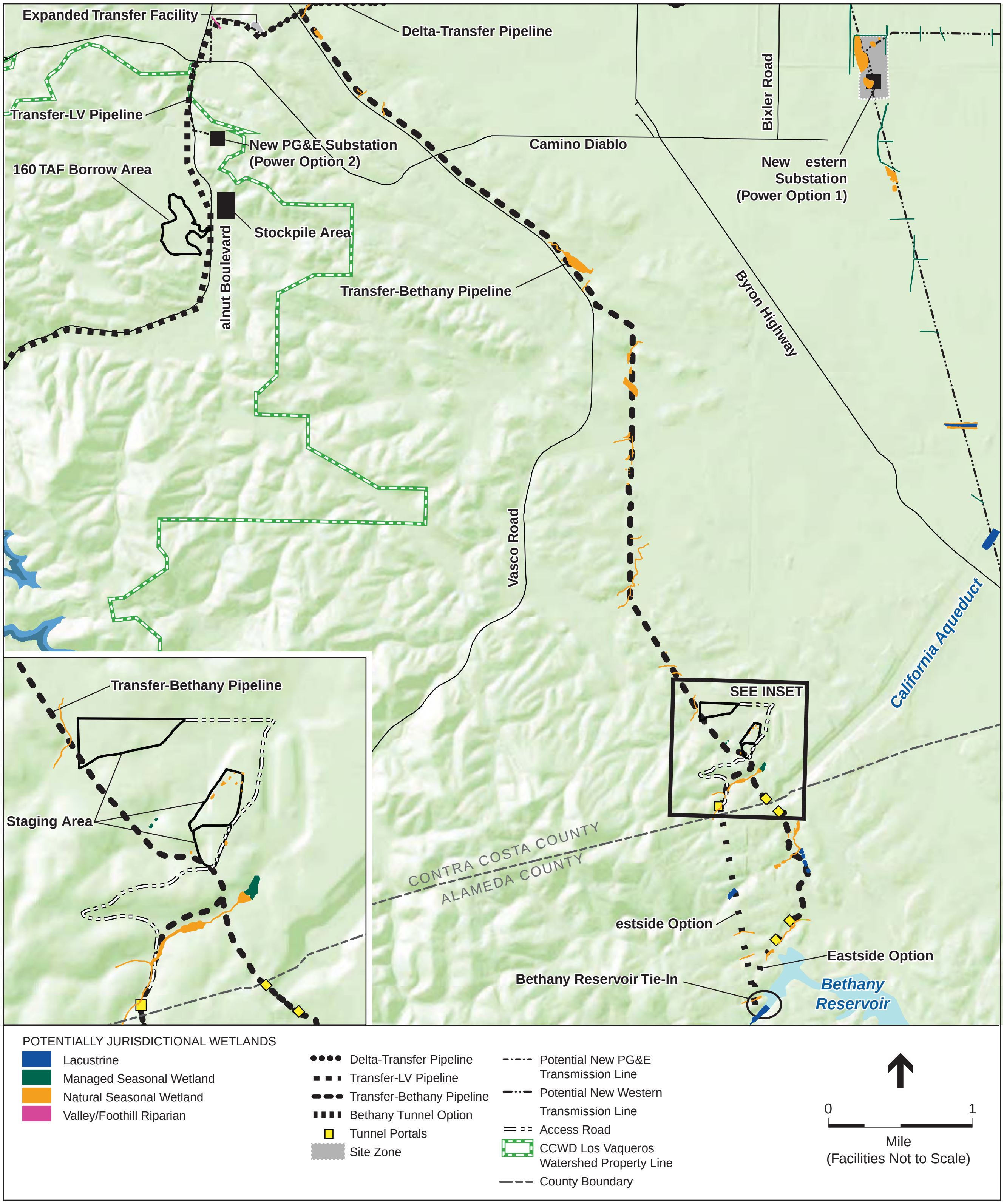
Figure 4.6-21
Potentiall urisdictional Wetlands in the
Vicinit of Other In Watershed Facilities



SOURCE: USGS, 1993 (base map); and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-22
Potential urisdictional Wetlands in the Vicinit of the Delta Inta e and Pump Station Facilities and Alon the Delta Transfer Pipeline



SOURCE: USGS, 1993; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-2
Potentiall urisdictional Wetlands in the Vicinit of the Transfer ethan Pipeline and Western Transmission Line

About 0.78 acre of the prior onsite wetland mitigation commitments for riparian habitat would be permanently flooded to accommodate an increase in reservoir levels to 275 TAF. In addition, about 2.27 acres of riparian mitigation habitat would be disturbed by grading, dewatering, trenching, and other construction activities within the Inlet/Outlet Pipelines construction area.

About 1.57 acres of the prior onsite mitigation commitments for freshwater emergent wetland habitat would be permanently inundated by reservoir expansion, as follows: (1) the spring mitigation site, which has one 0.15-acre emergent marsh; (2) the Clear Lake mitigation site, which has four emergent marsh features totaling 1.24 acres; and (3) the Canyon mitigation site, which has one 0.18-acre emergent marsh.

New Delta Intake and Pump Station

The new Delta Intake and Pump Station would permanently impact about 0.1 acre of emergent wetlands (cattail) habitat on the west bank of Old River. The new intake and fish screen would be 182 feet long and would impact about 0.13 acre of open water (182 feet by 30 feet). Additionally, the facility footprint would impact about 0.1 acre of emergent wetlands in engineered irrigation canals and ditches within agricultural portions of the project area. Temporary impacts to about 0.5 acre of open water would result from sheet-pile installation and dewatering of the construction area, and from excavation around the expanded fish screen intake.

Delta-Transfer Pipeline

Eight drainages cross along the Delta-Transfer pipeline alignment. Of these, four are small, maintained irrigation channels that do not support emergent vegetation and are likely not jurisdictional. The alignment traverses four blue-line[5] drainages. Of these, two are large, maintained, unvegetated drainage ditches near the town of Discovery Bay where the alignment parallels SR 4. These potentially jurisdictional features are about 15 feet wide, with an initial anticipated impact of 0.07 acre each. The other two features are alkali wetlands, one from the above-described area and the other just east of Vasco Road. The first of these features is a deep, trapezoidal channel that supports iodine bush, saltgrass, and a few willows. This feature measures about 40 feet across at the top of the bank and 15 feet at ordinary high water. The anticipated impact to jurisdictional wetlands at this site would be about 0.07 acre. The second feature, the blueline drainage near Vasco Road, supports a broad alkali swale dominated by saltgrass and saltbush (*Atriplex* sp.) that varies in width from an estimated 10 feet to 40 feet. The total anticipated impact to this feature is 2.97 acres.

After pipeline installation, the drainage features would be restored on site. No access vaults would be installed within the jurisdictional drainages that occur along the pipeline corridor. Thus, installation of the pipeline would result in the temporary impacts of 2.97 acre and no permanent impacts to potential jurisdictional features.

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5 A *blue-line* stream is one that flows for most or all of the year and is distinguished on U.S. Geological Survey topographic maps with a solid blue line.

Expanded Transfer Facility

No potentially jurisdictional features were identified in the Expanded Transfer Facility study area; therefore, no impacts are anticipated at this location.

Transfer-LV Pipeline

The Transfer-LV Pipeline alignment traverses Kellogg Creek at six locations, of which five are within the watershed. The character of Kellogg Creek varies between crossing sites, with two sites showing ephemeral flows and four sites supporting perennial water.

Of the two locations with ephemeral conditions, one is between the Transfer Station Facility and Walnut Boulevard, and the other is in the watershed, north of CCWD's administrative office. These locations are generally unvegetated (or indistinct from surrounding upland non-native grassland), but are steeply incised. Construction methods are open trench construction at all crossing locations.

Kellogg Creek demonstrates perennial conditions at four crossing locations in the watershed. These areas support some willow scrub and scattered oaks but portions of the banks are unvegetated except for non-native annual grasses and ruderal species.

Installation of the pipeline would result in temporary impacts to 0.67 acre and no permanent impacts to potential jurisdictional features. Kellogg Creek would be avoided within the remainder of the construction right-of-ways.

Transfer-Bethany Pipeline

Fifteen potentially jurisdictional drainages are on the Transfer-Bethany Pipeline alignment, including Brushy Creek (at Armstrong Road), six small, ephemeral unnamed drainages tributary to Brushy Creek, and eight unnamed tributaries to various unnamed channels in the Delta. Of these, five unnamed features are characterized as intermittent alkali swales that generally support saltbush (*Atriplex* sp.), saltgrass, and associated saline-adapted species. These intermittent features vary in width from narrow incised channels to broad alkaline meadows greater than 40 feet wide. Another five unnamed intermittent drainages are generally unvegetated (or indistinct from surrounding upland non-native grassland), but are incised. Lastly, the alignment crosses Brushy Creek where the drainage crosses Armstrong Road. Brushy Creek is an intermittent stream that is somewhat degraded due to cattle access. Brushy Creek supports some cattails (*Typha* sp.) but portions of the banks are unvegetated except for non-native annual grasses and ruderal species.

Installation of the pipeline would result in estimated temporary impacts to 3.03 acres of wetland and permanent impacts to twelve seasonal pools or topographic depressions totaling 0.86 acre that occur in or next to the Transfer-Bethany Pipeline.

Power Supply Infrastructure

Power Option 1: Western Only. Agricultural irrigation ditches and small seasonal wetlands are present throughout the Western powerline alignment. The proposed Western substation and powerlines occur primarily in existing agricultural areas, in use for crops, irrigated pasturelands, and grazed annual grasslands. Jurisdictional wetlands were identified on the Western substation study area. Because the study area is larger than the footprint, the proposed substation can be sited to avoid impacts to Natural Seasonal Wetlands based on 2008 wetland and rare plant survey findings.

Power Option 2: Western and PG&E. Agricultural irrigation ditches and small seasonal wetlands are present throughout the Western powerline alignment and would be spanned without impact.

Kellogg Creek is the only identified jurisdictional wetland in the PG&E study area. Powerlines would traverse the creek at two locations and poles would be sited outside of the creek corridor. Wetlands do not occur at the PG&E substation site. Therefore, wetland impacts are not anticipated from the PG&E substation and distribution line.

Summary for Alternative 1

Under Alternative 1, the project would directly impact wetland features both within and outside the Los Vaqueros Watershed and would affect mitigation wetlands created to compensate for the existing Los Vaqueros Reservoir. Within the watershed, Permanent Emergent Wetlands would experience the greatest permanent impacts by area (2.54 acres in 17 features). Permanent impacts would also be incurred to Natural Seasonal Wetlands (1.85 acres in 29 features), Riparian Wetlands (0.24 acre in one feature) and Lacustrine Wetlands (1.25 acre in 4 features). Impacts related to Alternative 1 would be significant prior to mitigation, but can be mitigated to a less-than-significant level through the incorporation of avoidance strategies, Best Management Practices, and onsite and offsite compensatory mitigation. Temporary impacts would be eliminated by site restoration and by removal of the cofferdam at the completion of in-channel work for the new Delta Intake and Pump Station. Impacts associated with Alternative 1 would be reduced to a less-than-significant level through the implementation of Mitigation Measure 4.6.2a, which seeks to avoid and minimize effects to wetlands and other waters to the greatest extent practicable and Mitigation Measure 4.6.2b, which provides compensation for impacts through wetland restoration or creation.

Alternative 2

Potential impacts to jurisdictional wetlands and waters, or streambeds and banks under Alternative 2 would be the same as those discussed for Alternative 1. These impacts are significant before the implementation of mitigation measures. Impacts would be reduced to a less-than-significant level through implementation of Mitigation Measures 4.6.2a and 4.6.2b.

Alternative 3

This alternative involves expansion of the Old River Intake and Pump Station and does not include construction of the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. Potential impacts to jurisdictional wetlands, waters of the United States, or streambeds and banks under Alternative 3 would be the same as those discussed for Alternative 1 with respect to the 275 TAF reservoir expansion and other in-watershed facilities, but less overall without the new Delta Intake and Pump Station and Transfer-Bethany Pipeline. Under this alternative, expansion of the Old River Intake and Pump Station would not involve physical site modification or disturbance on either the land or in the water, so there would be no impact to wetlands or waters at that project site. As shown in Table 4.6-10, total temporary impact would be 3.76 acres and the permanent effect would be 10.60 acres, compared to 7.29 acres temporary and 11.75 acres permanent impact for Alternative 1.

Anticipated impacts to jurisdictional wetlands and other waters of the United States are considered significant prior to mitigation. Impacts would be reduced to a less-than-significant level through implementation of Mitigation Measures 4.6.2a and 4.6.2b.

Alternative 4

Alternative 4 would result in much less impact to wetlands and waters than Alternative 1 because this alternative does not include many of the facilities required under Alternative 1 (i.e., no new or expanded pump station, no physical expansion of the Transfer Facility, and no new pipeline or electrical transmission facilities). Alternative 4 would result in the permanent fill or inundation of 3.65 acres of potentially jurisdictional wetlands or other waters of the United States and 0.04 acre of temporary impacts (Table 4.6-10), compared to 11.75 acres permanent and 7.29 acres of temporary impacts associated with Alternative 1.

Jurisdictional wetlands are not present in the 160-TAF borrow area. A temporary bridge crossing over Kellogg Creek would be required to provide equipment access to the borrow site. Stream intrusion would be minimal with installation activities performed on the top of the bank. The area of stream that would be shaded during borrow activities is estimated to be 0.1 acre (8 feet by 60 feet).

Bulrush-cattail and saltgrass series habitat (alkali marsh) at the Kellogg Creek wetland mitigation sites would be affected during construction. Mitigation wetlands would be filled and/or graded to accommodate construction activities within the construction area for the Inlet/Outlet Pipelines. About 0.78 acre of the onsite mitigation commitments for riparian habitat and 1.24 acres of emergent marsh would be permanently flooded by the expanded 160 TAF reservoir. In addition, about 2.27 acres of riparian mitigation habitat would be disturbed by grading, trenching, and other construction activities for the Inlet/Outlet Pipelines.

This impact is significant prior to mitigation. The implementation of Measures 4.6-2a, which seeks to avoid and minimize effects to wetlands and other waters to the greatest extent practicable, and Measure 4.6-2b, which includes mitigation for impacts to jurisdictional features, would reduce the impacts to a less-than-significant level.

Mitigation Measures

Measure 4.6.2a: Final project design shall avoid and minimize the fill of wetlands and other waters to the greatest practicable extent. Areas that are avoided shall be subject to best management practices under the General National Pollutant Discharge Elimination System Permit, as described in **Measure 4.5.1**.

The fill of wetlands at the proposed Western substation site shall be avoided by siting facilities within the study area so as to avoid impacts to such areas.

Measure 4.6.2b: Where jurisdictional wetlands and other waters cannot be avoided, to offset temporary and permanent impacts that would occur as a result of the project, restoration and compensatory mitigation shall be provided through the following mechanisms:

1. Purchase or dedication of land to provide wetland preservation, restoration or creation. If restoration is available and feasible, then a ratio of at least 2:1 shall be used. If a wetland needs to be created, at least a 3:1 ratio shall be implemented to offset losses. Where practical and feasible, onsite mitigation shall be implemented.

2. A wetland mitigation and monitoring plan shall be developed by a qualified biologist in coordination with CDFG, USFWS, USACE, and/or RWQCB that details mitigation and monitoring obligations for temporary and permanent impacts to wetlands and other waters as a result of construction activities. The plan shall quantify the total acreage lost, describe mitigation ratios for lost habitat, annual success criteria, mitigation sites, monitoring and reporting requirements, and site specific plans to compensate for wetland losses resulting from the project.

3. The mitigation and monitoring plan shall be submitted to the appropriate regulatory agencies for approval.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.3: Project construction could affect populations of special-status plant species including brittlescale, San Joaquin spearscale, Brewer's dwarf-flax, and rose-mallow. (Less than Significant with Mitigation)

The dates and findings of focused botanical surveys in the project study areas are presented in Table 4.6-3.

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Based on focused surveys, one special-status plant species was identified in oak woodland and upland scrub habitats that could be directly affected by reservoir inundation. Areas west of the reservoir support a 101.4-acre population of Brewer's dwarf-flax (see Figure 4.6-12). Portions of the population composed of an unknown number of individual plants would be affected by relocation of the westside access road (1.0 acre) and inundation (0.13 acre).

A brittlescale population consisting of about 25 plants was identified south of the proposed staging and stockpile area (ESA, 2007; see Figure 4.6-12). A San Joaquin spearscale population was also verified south of the proposed staging and stockpile area. Both populations occur outside of the project area (CDFG, 2008).

New Delta Intake and Pump Station

A rose-mallow population consisting of fewer than 15 plants occurs at the site for the new Delta Intake and Pump Station. Other local populations are greater than 1,000 feet from new facilities and are outside the project area.

Delta-Transfer Pipeline

The Delta-Transfer Pipeline alignment primarily traverses lands that are developed or used for agriculture. Suitable habitat for special-status plant species was not identified in the study area; therefore, no impacts are expected (ESA, 2007).

Expanded Transfer Facility

Reconnaissance-level botanical surveys conducted at the Expanded Transfer Facility in 2007 showed the study area to be highly disturbed. Due to prior soil manipulation and high densities of non-native herbaceous plants, the site does not support special-status plant species and no impacts are anticipated (ESA, 2007).

Transfer-LV Pipeline

The majority of the Transfer-LV Pipeline alignment is within the watershed, and focused plant surveys indicate that no special-status plant species would be affected by pipeline construction. The segment from the watershed boundary to the Expanded Transfer Facility crosses a livestock pasture, a segment of Kellogg Creek, and maintained annual grassland. No suitable habitat for special-status plant species is available in the study area; therefore, no impacts are expected (ESA, 2007).

Transfer-Bethany Pipeline

Focused botanical surveys (ESA, 2008b) and database searches (CDFG, 2008) identified several San Joaquin spearscale populations in the alignment near Armstrong Road (Figure 4.6-13). Limited follow-up surveys would be required for both spearscale and brittlescale at a few distinct locations.

Power Supply Infrastructure

Power Option 1: Western Only. Based on focused botanical surveys in spring 2008, power poles are not expected to impact special-status plant populations (ESA, 2008b). San Joaquin spearscale populations identified in the Western powerline alignment would be avoided by siting the Western substation and power poles away from the spearscale populations. Limited follow-up surveys would be required to document the distribution of heartscale and brittlescale, though the likelihood of encountering these species in the alignment is considered low.

Power Option 2: Western and PG&E. San Joaquin spearscale populations identified in the Western powerline alignment would be avoided by siting the power poles away from the spearscale populations. Limited follow-up surveys would be required to document the distribution of heartscale and brittlescale, though the likelihood of encountering these species in the alignment is considered low.

Special-status plant populations were not identified in the PG&E study area (ESA, 2008b). Therefore, impacts are not anticipated from the PG&E substation and distribution line from the PG&E substation to the Transfer Facility.

Summary of Alternative 1

Under Alternative 1, the project would directly impact special-status plant populations including Brewer's dwarf-flax, rose-mallow, and San Joaquin spearscale. An unknown number of individual Brewer's dwarf-flax plants would be affected by inundation and relocation of the westside access road, a small population of rose-mallow would be affected at the new Delta Intake and Pump Station site, and a population of San Joaquin spearscale would be affected by the Transfer-Bethany Pipeline alignment. Limited follow-up surveys would be needed to assess the presence of heartscale and brittlescale populations that may be present in several distinct locations on the Transfer-Bethany Pipeline and on the Western powerline alignment.

Impacts related to Alternative 1 would be significant prior to mitigation, but can mitigated to a less-than-significant level through avoidance, protection, restoration, and habitat enhancement. Impacts associated with Alternative 1 would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.3a, which strives to minimize impacts through avoidance strategies and protective measures; and Mitigation Measure 4.6.3b, which provides compensation for impacts through restoration and habitat enhancement.

Alternative 2

Alternative 2 would have identical impacts to special status plant populations as Alternative 1. This is considered a significant impact prior to mitigation. Impacts associated with Alternative 2 would be reduced to a less-than-significant level through implementation of Mitigation Measures 4.6.3a and 4.6.3b.

Alternative 3

Potential impacts to special-status plant species under Alternative 3 would be somewhat less than those described for Alternative 1. Without the Transfer-Bethany Pipeline, impacts to special-status plants would be limited to Brewer's dwarf-flax within the watershed (as described for Alternative 1). Expansion of the Old River Intake and Pump Station proposed under this alternative only would not involve any physical site modification or disturbance either on the land or in the water. Therefore, expansion of this facility would not affect local rose-mallow populations.

Limited follow-up surveys would be needed to assess the presence of heartscale and brittlescale populations that may be present in several distinct locations on the Western powerline alignment.

Impacts to these species would be a significant impact prior to mitigation. Impacts associated with Alternative 3 would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.3a and 4.6.3b.

Alternative 4

No special-status plant populations are known within the 160-TAF inundation zone and no populations would be affected in the surrounding study area (ESA, 2007) (Figure 4.6-13). The 160-TAF borrow area does not support special status plants. Impacts to special status plant populations would not occur under Alternative 4.

Mitigation Measures

Mitigation Measures 4.6.3a and 4.6.3b include focused plant surveys coupled with avoidance and minimization of impacts; harvesting, transplanting, and long-term maintenance of affected individuals; and the establishment of permanent mitigation sites that provide the specific habitat needs for each affected species. Implementation of these mitigation measures would reduce the impacts on special-status plant species to a less-than-significant level.

Measure 4.6.3a: Where necessary (see Figures 4.6-12 and 13), CCWD shall complete focused plant surveys on out-of-watershed pipeline alignments and facilities following CDFG and USFWS special-status plant survey guidelines. Comprehensive special-status plant surveys have been completed, except at a few sites on the Transfer-Bethany Pipeline alignment, within the Western substation siting zone (Power Option 1), and within the Western powerline alignment associated with Power Option 2 (i.e., within the siting zone for the new Western substation described above) and 2) and north of the Skinner Delta Fish Protective Facility (Power Option 2). Surveys shall document the location, extent, and size of *Atriplex* (brittlescale and heartscale) populations, if present, and shall be used to inform the planned avoidance of rare plant populations whenever possible. The Western substation shall be sited within the Western substation study area so as to avoid and minimize impacts to San Joaquin spearscale.

To the extent feasible, the final project design shall minimize impacts on known special-status plant populations within and next to the construction footprints. CCWD and its contractors will design facilities to avoid sensitive plant populations whenever feasible, and shall install exclusion fencing and/or silt fencing around sensitive plant populations with as large a buffer as possible to minimize the potential for direct and indirect impacts such as fugitive dust and accidental intrusion into sensitive areas. Dust and erosion control measures are described in **Measure 4.5.1**.

Measure 4.6.3b: Where avoidance is not feasible, CCWD shall compensate for the loss of special-status plants through the following steps:

- A qualified ecologist shall develop and implement a restoration and mitigation plan according to CDFG guidelines and in coordination with CDFG and USFWS. At a minimum, the plan shall include collection of reproductive structures from affected plants, a full description of microhabitat conditions necessary for each affected species, seed germination requirements, restoration techniques for temporarily disturbed occurrences, assessments of potential transplant and enhancement sites, success and performance criteria, and monitoring programs, as well as measures to ensure long-term sustainability. The mitigation plan shall apply to portions of the Los Vaqueros Watershed, portions of Transfer-Bethany Pipeline that require vernal pool restoration (i.e., near Byron Airport), and areas that support rose-mallow on the banks of Old River.

- Land that supports known populations of affected special-status plants shall be identified, enhanced, and protected within the watershed or acquired outside of the watershed at a ratio of 1.1:1 and protected in perpetuity with conservation easements.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.4: Project construction would result in impacts on California red-legged frog and California tiger salamander, including aquatic breeding habitat and upland aestivation habitat for these species. (Less than Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Project construction has the potential to directly affect the California red-legged frog and California tiger salamander, permanently alter or inundate aquatic breeding sites for these species, and inundate upland aestivation sites. Permanent impacts on aquatic sites and upland aestivation habitat would generally occur as a result of reservoir inundation, while temporary impacts on upland aestivation areas would occur along pipeline corridors that traverse undeveloped, annual grasslands.

Direct impacts on known and potential aquatic breeding sites include the loss of 11 ponds in the 275-TAF reservoir inundation area. Five ponds in the Inlet/Outlet Pipelines construction area, each of which supports California red-legged frog breeding, would be avoided by project design; however, these ponds are subject to long-term temporary (i.e., greater than 1 year) dewatering during construction, as Los Vaqueros Reservoir will be unavailable as a water source during this period. Ten of the 11 inundated ponds support California red-legged frog breeding populations and four ponds support California tiger salamander breeding (see Figures 4.6-7 and 4.6-8 and **Table 4.6-11**). Eighteen stock ponds are dependent upon the reservoir for supplemental water.

A GIS analysis of potential and known breeding sites and available annual grassland and oak woodland upland habitats that occur within an accessible distance to breeding ponds (e.g., within 1 kilometer [0.62 mile]) indicates that all undisturbed annual grasslands and oak woodland habitats in the watershed may support aestivating California tiger salamanders or California red-legged frogs, and provide upland movement corridors for these species. The expansion of the Vaqueros Reservoir and associated in-watershed facilities would cause the direct and permanent loss of 976.2 acres of annual grasslands and 149.6 acres of oak woodlands, representing a total of 1,125.8 acres of upland aestivation and migratory habitat potentially occupied by these species (see **Table 4.6-12**). In the Inlet/Outlet Pipelines construction area, construction activities would last for 2 years. The areas of temporary disturbance would ultimately be restored to annual grasslands or oak woodland after project construction. An unknown number of California red-legged frogs and California tiger salamanders would be destroyed as a result of these impacts to upland habitat and aquatic habitat sites.

TABLE 4.6-11
IMPACTS ON CALIFORNIA TIGER SALAMANDER AND CALIFORNIA RED-LEGGED FROG AQUATIC HABITAT

Pond Name	Description	California Tiger Salamander	California Red-Legged Frog
N1W (To be avoided and dewatered)	Constructed alkali marsh pond with a supplemental water source; semipermanent water	Not identified	Breeding
N2W (To be avoided and dewatered)	Constructed alkali marsh pond with a supplemental water source; semipermanent water	Not identified	Breeding
N3W (To be avoided and dewatered)	Constructed alkali marsh pond with a supplemental water source; semipermanent water	Not identified	Breeding
N4W (To be avoided and dewatered)	Constructed alkali marsh pond with a supplemental water source; semipermanent water	Not identified	Breeding
N5W (To be avoided and dewatered)	Constructed alkali marsh pond with a supplemental water source; semipermanent water	Not identified	Breeding
K6W*	Constructed semipermanent marsh pond. No supplemental water provided	Not identified	Breeding
K7W*	Constructed semipermanent marsh pond. No supplemental water provided	Not identified	Breeding
K8W*	Constructed semipermanent marsh pond. No supplemental water provided	Not identified	Breeding
K9W*	Constructed semipermanent marsh pond. No supplemental water provided	Breeding	Present, breeding not known
D7*	Nonmitigation stock pond; permanent water. No supplemental water provide	Not identified	Breeding
D11*	Nonmitigation stock pond; permanent water. No supplemental water provided	Breeding	Breeding
F1	Constructed semipermanent marsh pond; water retention issues (2005)	Not identified	Not observed (2005)
F2	Nonmitigation stock pond; permanent water. No supplemental water provided	Not identified	Breeding
F4	Nonmitigation stock pond; permanent water. No supplemental water provided	Not identified	Breeding
F8*	Nonmitigation stock pond; permanent water. No supplemental water provided	Breeding	Breeding
F11W	Constructed semipermanent marsh pond. No supplemental water provided	Breeding	Breeding

Note: an asterisk (*) indicates the ponds that would be impacted under Alternative 4, and includes 7 of the 16 features. All 16 sites would be impacted under Alternatives 1, 2, or 3.

TABLE 4.6-12
IMPACTS ON CALIFORNIA TIGER SALAMANDER AND CALIFORNIA RED-LEGGED FROG UPLAND AESTIVATION HABITAT (ACRES)

	Grasslands		Oak Woodland	Other Habitats[1]	
Project Component	**Permanent Impact**	**Temporary Impact**	**Permanent Impact - Oak Woodland**	**Permanent Impact**	**Temporary Impact**
Alternatives 1 and 2					
In-watershed Facilities[2]	976.2	45,8	149.5	12.3	0
Delta-Transfer Pipeline	0	24.2	0	0	0
Transfer-LV Pipeline	0	76.5	0.1	0	0.7
Transfer-Bethany Pipeline	0	150.9	0	0	23.5
Expanded Transfer Facility	(1.2)[3]	0	0	0	0
Total - Alternatives 1 and 2	976.2	297.4	149.6	12.3	24.4
Alternative 3					
In-watershed Facilities	976.2	45.8	149.5	12.3	0
Delta-Transfer Pipeline	0	24.2	0	0	0
Transfer-LV Pipeline	0	76.5	0.1	0	0.7
Total – Alternative 3	976.2	146.5	149.6	12.3	0.7
Alternative 4					
In-watershed Facilities	498.5	19.2	22.1	12.2	0
Total – Alternative 4	498.5	19.2	22.1	12.2	0.0

1 Other habitats include lacustrine, natural seasonal wetland, saline emergent/nontidal freshwater, upland cropland, upland scrub, urban/disturbed, and valley/foothill riparian
2 In-watershed facilities includes the PG&E substation. Habitat for California tiger salamander and California red-legged frog does not occur at the Western substation site.
3 Habitat at the Expanded Transfer Facility is considered low quality aestivation habitat for the California tiger salamander and California red-legged frog and is not included in the total below.

Water would be bypassed around Los Vaqueros Dam during construction so that water releases into lower Kellogg Creek would be maintained during construction. Water would also continue to enter the lower reach of the creek seasonally from other natural sources tributary to the creek (e.g., spring releases, surface runoff, and groundwater). With maintained flows, the quality and availability of breeding and nonbreeding (summer) habitat for California red-legged frogs is not expected to change markedly in Kellogg Creek.

New Delta Intake and Pump Station

Habitat for California red-legged frog and California tiger salamander does not occur near the new Delta Intake and Pump Station, therefore no impacts are anticipated at this location.

Delta-Transfer Pipeline

The Delta-Transfer Pipeline alignment traverses 24.2 acres of potentially occupied California red-legged frog and California tiger salamander aestivation habitat that occur over a linear distance of 1.2 miles (see Table 4.6-12). A 200-foot-wide construction corridor would result in a direct, temporary impact on 24.2 acres of potentially occupied upland habitat. One potential aquatic breeding site occurs about 0.25 mile north of the pipeline alignment, but would not be directly or indirectly affected by construction.

Transfer-LV Pipeline

Along the Transfer-LV Pipeline alignment, 76.5 acres of potentially occupied aestivation habitat (ranging over 4.3 linear miles) could be temporarily affected (see Table 4.6-12). A 200-foot-wide construction corridor would have a direct, temporary impact on 76.5 acres of potentially occupied upland habitat. At least two aquatic sites are within 0.25 mile of the pipeline alignment that support breeding California red-legged frogs, and five California tiger salamander breeding ponds downstream from Los Vaqueros Dam could be affected by the pipeline construction. Additionally, the alignment crosses Kellogg Creek at three locations that could support red-legged frogs (nonbreeding habitat), and the creek corridor could be subject to major disturbances in the Inlet/Outlet Pipelines construction area. All pipeline impacts upon aestivation habitat would be temporary. California tiger salamanders are not known or expected to breed in Kellogg Creek.

Transfer-Bethany Pipeline

Along the Transfer-Bethany Pipeline alignment, 7.7 miles of potentially occupied California red-legged frog and California tiger salamander aestivation habitat could be temporarily affected (see Table 4.6-12). A 300-foot-wide construction corridor would result in a direct, temporary impact on 150.9 acres of potentially occupied upland habitat. At least two aquatic sites are within 0.25 mile of the pipeline alignment that could be affected by construction. The pipeline alignment crosses Brushy Creek along Armstrong Road and would temporarily affect aquatic habitat in the creek at that location. All pipeline impacts upon aestivation habitat would be temporary.

Power Supply Infrastructure

Power Option 1: Western Only. California tiger salamander and California red-legged frog do not occur within the Option 1 study area; thus, no impacts are anticipated from proposed facilities.

Power Option 2: Western and PG&E. California tiger salamanders and California red-legged frogs do not occur within the Option 2 study area for power facilities from Western; thus, no impacts are anticipated from proposed facilities.

The PG&E substation is proposed in an area that may provide suitable aestivation for California tiger salamanders, with potential breeding sites near Kellogg Creek, less than 0.5 mile west of proposed facilities. Therefore, the likelihood exists that migrating or aestivating adult salamanders or California red-legged frogs could be harmed during construction. This impact is treated as part of the in-watershed facilities impact acreage in Table 4.6-12.

Expanded Transfer Facility

Construction of the Expanded Transfer Facility could affect 1.2 acres of potentially occupied upland habitat for California tiger salamander. California red-legged frogs are expected to use this area only intermittently due to the lack of site cover, primarily to disperse between aquatic sites. Because this potential habitat is of low quality, it is not included in the acreage totals in Table 4.6-12.

Summary for Alternative 1

Under Alternative 1, the project would directly impact California red-legged frog and California tiger salamander individuals, aquatic breeding habitat, and upland aestivation habitat through inundation, reduction in supplemental water supplied from the reservoir to ponds, sustained dewatering of some ponds, and other construction activities. Upland aestivation and migratory habitat in the form of grasslands would see the greatest impact by area. In all cases, impacts related to Alternative 1 would be significant prior to mitigation, but can be mitigated to a less-than-significant level through avoidance and impact-minimization measures, through the incorporation of onsite and offsite compensatory mitigation, and through provision of supplemental water to pond breeding sites during construction. Under Alternative 1, flows would be maintained in lower Kellogg Creek using a bypass around Los Vaqueros Dam. Impacts associated with Alternative 1 would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.4a, which serves to avoid and minimize species take, and Mitigation Measure 4.6.4b, which provides compensation for impacts through land acquisition and habitat management.

Alternative 2

Project impacts to California red-legged frog, California tiger salamander and habitat for these species due to project implementation under Alternative 2 would be the same as those discussed for Alternative 1 (Table 4.6-12). This is considered a significant impact prior to mitigation. Impacts associated with Alternative 2 would be reduced to a less-than-significant level through implementation of Mitigation Measures 4.6.4a and 4.6.4b.

Alternative 3

In the absence of the Transfer-Bethany pipeline, impacts to California red-legged frogs and California tiger salamanders and their habitat would be about 173 acres less than under Alternative 1 (Table 4.6-12). These species do not occur near the Expanded Old River Intake and Pump Station, thus impacts would not occur at this location. This impact is significant prior to mitigation. Implementation of Mitigation Measures 4.6.4a and 4.6.4b would reduce these potential impacts to a less-than-significant level.

Alternative 4

Under Alternative 4, project construction has the potential to directly affect California red-legged frogs and California tiger salamanders, permanently inundate aquatic breeding sites for these species, and inundate upland aestivation sites within the currently described migratory capabilities of each species. Permanent impacts on aquatic sites and upland aestivation habitat would be restricted to the area of reservoir inundation and borrow sites.

Direct impacts on known and potential aquatic breeding sites include the loss of seven ponds in the 160-TAF reservoir inundation area. As discussed for Alternative 1, five ponds below Los Vaqueros Dam could be subject to temporary dewatering during construction. Seven of the above ponds support California red-legged frog breeding populations and three support California tiger salamander breeding (see Figures 4.6-7 and 4.6-8 and Table 4.6-12).

The expansion of the Los Vaqueros Reservoir to 160 TAF and associated in-watershed facilities would cause the direct and permanent loss of 498.5 acres of annual grasslands and 22.1 acres of oak woodlands, a total of 520.6 acres of upland aestivation habitat potentially used by these species (see Table 4.6-12). Temporary disturbances to upland habitat would occur in the 160-TAF borrow area. Because the exact location of alluvial deposits within the borrow area is unknown, a borrow area zone was analyzed for impact analysis purposes (see Figure 3-18). As shown on the figure, in the general area proposed for borrow materials, restricted areas where no borrow activities would occur have been identified and would avoid impacts to California red-legged frog and California tiger salamander aquatic breeding habitat. The areas of temporary disturbance would ultimately be restored to annual grasslands after construction. An unknown number of California red-legged frogs and California tiger salamanders would be destroyed as a result of impacts to upland habitat and aquatic habitat sites.

This impact remains significant prior to mitigation. Implementation of Mitigation Measures 4.6.4a and 4.6.4b would reduce these potential impacts to a less-than-significant level.

Mitigation Measures

The implementation of Measure 4.6.4a, which includes measures to avoid and minimize take of individual frogs and salamanders, and Measure 4.6.4b, which provides for habitat compensation and enhancement, would reduce the impacts on California red-legged frogs and California tiger salamanders to a less-than-significant level.

Measure 4.6.4a: CCWD shall implement measures to minimize and avoid take of California red-legged frogs and California tiger salamanders. Before and during construction, the following actions shall minimize impacts on these species:

- CCWD shall submit the name and credentials of a biologist qualified to act as construction monitor to USFWS for approval at least 15 days before construction work begins. General minimum qualifications are a 4-year degree in biological sciences or other appropriate training and/or experience in surveying, identifying, and handling California tiger salamanders and California red-legged frogs.

- A USFWS-approved biologist shall survey the work sites 2 weeks before the onset of construction. If California tiger salamanders or California red-legged frogs (or their tadpoles or eggs) are found, the approved biologist shall contact USFWS to determine whether moving any of these life-stages is appropriate. If USFWS approves moving the animals, the approved biologist shall be allowed sufficient time to move frogs and/or salamanders from the work sites before work begins. If these species are not identified, construction can proceed at these sites. The approved biologist shall use professional judgment to determine whether (and if so, when) the California tiger salamanders and/or California red-legged frogs are to be moved. The USFWS-approved biologist shall immediately inform the construction manager that work should be halted, if necessary, to avert avoidable take of listed species.

- Areas will be monitored during construction to identify, capture, and relocate sensitive amphibians, if present.

- A detailed California red-legged frog/California tiger salamander relocation plan will be prepared at least 3 weeks before the start of groundbreaking, and submitted to USFWS for review. The purpose of the plan is to standardize amphibian relocation methods and relocation sites.

- A USFWS-approved biologist shall be present at the active work sites until California red-legged frogs and California tiger salamanders have been removed, and habitat disturbance has been completed. Thereafter, the contractor or CCWD shall designate a person to monitor onsite compliance with all minimization measures. A USFWS-approved biologist shall ensure that this individual receives training consistent with USFWS requirements.

- CCWD and its contractors shall initiate all work within potential California red-legged frog aquatic breeding habitat between May 1 and November 1 (i.e., generally identified as the nonbreeding season). Project construction timing constraints are summarized in Section 4.6.3.

- CCWD and its contractors shall install frog-exclusion fencing (i.e., silt fences) around all construction areas that are within 100 feet of potential California red-legged frog or California tiger salamander aquatic breeding habitat.

- A USFWS-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the California red-legged frog and California tiger salamander and their habitat, the importance of these species and their habitat, the general measures that are being implemented to conserve the red-legged frog and tiger salamander as they relate to the project, and the boundaries within which the project construction shall occur.

- During work activities, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. After construction, the contractor shall remove all trash and construction debris from work areas on a daily basis.

- All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 20 meters (65.6 feet) from any riparian habitat or water body.

- Before the onset of work, CCWD shall prepare a stormwater pollution prevention plan and water pollution control plan as described in Measures 4.5.1a and 4.5.1b to allow prompt and effective response to any accidental spills.

- Before construction begins, CCWD shall prepare a plan describing pre-project conditions, restoration, and monitoring success criteria. CCWD or its contractors shall restore the contours and revegetate all areas disturbed by the project with an appropriate assemblage of native vegetation suitable to the area.

- Where needed to maintain California red-legged frog and/or California tiger salamander breeding in existing mitigation wetlands that are presently supplemented with water, but are not directly disrupted by construction, CCWD shall continue to provide supplemental water to these ponds during and after construction according to the existing terms and conditions for these mitigation sites.

Measure 4.6.4b: CCWD shall provide compensation for permanent and temporary impacts on California tiger salamander and California red-legged frog aquatic habitat. In accordance with MSCS (CALFED, 2000) objectives, CCWD shall provide compensation for the permanent loss of California red-legged frog and California tiger salamander aquatic habitat at a minimum of a 3:1 ratio. The MSCS does not require compensation for loss of California red-legged frog and California tiger salamander aestivation habitat. To satisfy compensation guidelines, CCWD shall implement the following measures:

- CCWD shall mitigate for the loss of aquatic breeding sites that will be filled or otherwise directly affected by the project (estimated to be 16 sites at this time; number to be confirmed by pre-construction surveys) as well as mitigate for impacts on associated California red-legged frog upland habitat by providing compensatory habitat.

- CCWD shall develop and implement a mitigation, monitoring, and management plan, with input from regulatory agencies that shall outline long-term management strategies and performance standards to be attained to compensate for habitat losses resulting from the project. At a minimum, the plan shall include standards for mitigation site selection and construction specifications for mitigation sites, a description of site conditions including aerial maps, an analysis of local amphibian habitat (e.g., is another breeding habitat nearby?), and performance criteria by which site quality can be assessed over time (see below). A monitoring program shall be established to track the development of habitat conditions that are conducive to the establishment of the California red-legged frog and/or California tiger salamander breeding populations. Long-term monitoring (e.g., night surveys and aquatic dipnet surveys) shall be performed on an annual basis to determine if these species are present. The plan shall provide that monitoring be performed to ensure that mitigation ponds that are dependent upon artificial water function as designed.

- Performance criteria shall be used to assess the success of aquatic habitat created for California red-legged frogs and California tiger salamander aquatic habitat. These criteria shall be outlined in the mitigation, monitoring and management plan and shall include:

    - A description of the type of habitat to be created (e.g., permanent marsh consisting of open water and emergent vegetation; semipermanent marsh);

    - The total area, size and number of California red-legged frog and California tiger salamander mitigation ponds to be created based on a comparable loss of breeding sites (e.g., 1:1 replacement ratio) as a result of the project. These ponds shall concurrently satisfy wetland mitigation requirements identified in Measure 4.6.2b;[6]

    - Constructed permanent marsh ponds that are designed to support California red-legged frog breeding shall provide:

        - at least 75% absolute vegetation cover of wetland plant species within shallow water emergent vegetation zones;

[6] Note that final mitigation acreage requirements and compensation ratios may be adjusted by the USFWS or USACE based on actual wetland impacts, which will be identified during the permitting process.

        - year-round inundation with depths of at least 1.5 feet in the vegetation zone and 4 feet in open water.

    - Constructed semipermanent marsh ponds that are designed to support California tiger salamander or California red-legged frog breeding habitat shall provide:

        - water regimes similar to affected features, with semi-permanent water ranging from depths of 1.5 to 2.5 feet or greater during a typical rainfall year and an inundation period that exceeds 120 consecutive days;

        - a predominance of seasonal wetland plants (at least 75% absolute vegetation cover) during the winter/spring monitoring period (though may support upland species later in the year when pools dry).

- To the greatest practicable extent, CCWD or its contractors shall construct and manage compensation habitat (i.e., replacement ponds) for California red-legged frogs and California tiger salamanders prior to project implementation. A qualified biologist shall ensure that ponds are functioning before the removal and/or inundation of existing California tiger salamander and California red-legged frog aquatic breeding sites.

- Construction within the Kellogg Creek corridor (i.e., creek crossing sites) shall be designed to impact the smallest area required to provide for the installation of pipelines, particularly in the area below Los Vaqueros Dam.

- CCWD and its contractors shall restore and enhance Kellogg Creek and adjacent natural upland environs in the project area (about 4.0 linear miles) to restore suitable aquatic breeding habitat for California red-legged frogs and restore disturbed upland areas as close as possible to pre-project conditions. Methods of enhancement and restoration could include, but are not limited to, reducing erosion; installing breeding ponds; excluding cattle from sensitive areas; and managing, salvaging, and seeding with grasses, forbs, and other species that are native to the site, as well as other measures to increase water quality within the enhancement and restoration reach.

New mitigation ponds that are created for California red-legged frog and California tiger salamander shall be hydrologically self-sustaining and shall not require a supplemental water supply. Because few natural drainages in the Los Vaqueros Watershed could maintain self-sustaining mitigation ponds, a portion of the pond mitigation locations will likely be identified outside of the watershed.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.5: Project construction would result in direct and indirect impacts on existing populations of and habitat for the western pond turtle. (Less than Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Construction of the Expanded Los Vaqueros Reservoir, in-watershed facilities, and recreational facilities would directly affect known western pond turtle populations as well as both aquatic and upland habitat for the western pond turtle. Six stock ponds, ten created wetlands, and several drainages (including Kellogg Creek) would be affected by reservoir inundation and in-watershed activities; of these areas, at least three ponds known to support western pond turtles would be directly affected by inundation. Eight ponds that support western pond turtles would be directly affected by construction of Los Vaqueros Dam, associated Inlet/Outlet Pipelines, and relocation of the westside access road.

Western pond turtles are documented in the Inlet/Outlet Pipelines construction area, and this species may opportunistically be encountered in ponds, within Kellogg Creek, or in uplands in this area. Where possible, siting of the pipeline and construction activity would avoid aquatic features that could support this species. Turtles would be relocated if encountered in work areas, and turtle populations would be monitored to ensure successful relocation. Due to topographic constraints, such as steep slopes and narrowing canyons that arise at higher elevations in the watershed, it might not be feasible to replace all the directly affected wetland features near the point of impact, or even in nearby portions of the watershed. Thus, adult western pond turtles might need to be relocated to nearby offsite mitigation sites. While it could be possible to identify and relocate individual turtles, nest sites can be difficult to find because they are often away from aquatic areas and do not stand out from adjacent habitat. Nesting generally extends from late April through August, depending on the latitude, with a peak from late May to early July (Lovich, undated). It is anticipated that reservoir inundation at any time of the year could cause the direct loss of an unknown number of active nests.

Direct long-term temporary (i.e., greater-than-1-year) impacts would include disturbance of potential western pond turtle habitat in the construction zone along Kellogg Creek associated with dam and Inlet/Outlet Pipelines construction. Outside the construction zone, flows to Kellogg Creek would be maintained with a bypass running from water sources in the upper creek as part of Alternative 1. Downstream from Los Vaqueros Dam, the creek would still receive water from other contributing portions of the watershed and some ponding would be maintained in this creek.

New Delta Intake and Pump Station

Western pond turtles are not known to occur in the new Delta Intake and Pump Station project study area, but turtle basking habitat, including rocks and floating logs and boards, are present in the project area on the banks of Old River. Potential nesting habitat is available in friable soils between Old River levee and adjacent agricultural lands. This area is within the described range of this species, thus, it is possible that pond turtles or turtle nests could be destroyed during construction of the new intake structure, during dewatering activities in Old River, or when turtles are encountered by equipment in uplands areas.

Delta-Transfer Pipeline

Impacts resulting from construction of the Delta-Transfer Pipeline generally would include upland disturbances within the 200-foot-wide construction corridor. Impacts would not be permanent, and disturbed habitat would be restored with native vegetation or returned to agricultural uses. Western pond turtles are not known to occur within 500 feet of the pipeline alignment, and aquatic sites that would support this species are generally limited in and near the construction corridor. Wetlands would be avoided where possible and restored where avoidance is not feasible. Therefore, direct impacts on western pond turtles or their associated habitat are not expected.

Expanded Transfer Facility

Western pond turtles are not reported near the Expanded Transfer Facility study area, and no aquatic habitat in the near-project area would support this species. Therefore, no direct or indirect impacts on western pond turtles are expected.

Transfer-LV Pipeline

Three western pond turtle occurrences are reported near the Transfer-LV Pipeline alignment (CDFG, 2008). These occurrences include areas along lower Kellogg Creek, where several stock ponds and created wetlands support this species. All aquatic features, including Kellogg Creek, stock ponds, and adjacent upland habitat, provide suitable habitat for western pond turtles. This species is expected at aquatic sites and may occur sporadically in upland areas.

Transfer-Bethany Pipeline

Impacts resulting from construction of the Transfer-Bethany Pipeline would include disturbance of habitat within the 300-foot-wide construction corridor. Western pond turtles could be destroyed within construction corridors during their ordinary upland movement activities. Habitat impacts would be temporary because disturbed upland habitat would be restored with native vegetation after pipeline construction is completed. Western pond turtles are not reported within 500 feet of the pipeline alignment. The likelihood is low that this species would be encountered in annual grasslands during construction.

Power Supply Infrastructure

Power Option 1: Western Only. Western pond turtles are documented from aquatic habitat in Italian Slough, and may be present in irrigation canals that traverse the Western powerline study area or adjacent upland habitat. This species may be encountered at any location on the Western powerline alignment. Impacts would be limited to disturbance and potential encounters during construction, with no permanent habitat impacts.

Power Option 2: Western and PG&E. Western pond turtles may be present in irrigation canals that traverse the Option 2 Western powerline study area or adjacent upland habitat. Impacts include potential encounters with adult turtles during construction, but no permanent habitat impacts.

Near the PG&E substation, western pond turtles are known from Kellogg Creek and may be infrequently encountered in upland areas and subject to vehicle mortality during construction.

Summary for Alternative 1

Under Alternative 1, the project would directly impact western pond turtle individuals and aquatic and upland nesting habitat through inundation, road relocation, and upland construction. Impacts related to Alternative 1 would be significant prior to mitigation but would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.5, which calls for surveys to identify individuals and nests in the construction area and relocate them.

Alternative 2

Potential impacts to western pond turtles and their habitat would be the same as those discussed for Alternative 1. Impacts would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.5, which calls for surveys to identify individuals and nests in the construction area and relocate them.

Alternative 3

Impacts to western pond turtles and their habitat at the reservoir and within the watershed would be the same as those described for Alternative 1. Outside the watershed, potential impacts would be lower under Alternative 3 than under Alternative 1 because this alternative would not include construction of either the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. Thus, this alternative would avoid any potential impact associated with these two facilities. Expansion of the Old River Intake and Pump Station proposed under this alternative only would not involve any physical site modification or disturbance either on the land or in the water. Therefore there would be no impact to western pond turtle at this site.

Impacts under this alternative would be considered significant direct effects of the project. The implementation of Mitigation Measure 4.6.5 would ensure that impacts to western pond turtles are minimized and reduce project effects to a less-than-significant level.

Alternative 4

A 160-TAF reservoir expansion would inundate or destroy seven created wetlands and several drainages (including Kellogg Creek) that are known to support western pond turtle populations. The majority of these features, both upstream and downstream from the dam, would be available to turtles during construction, as would the lowered Los Vaqueros Reservoir.

Because the reservoir would not be fully drained under this alternative, turtles would likely stay within Los Vaqueros Reservoir and be less likely to wander into upland areas, including the Dam construction site, than under Alternative 1. This species could be disturbed or destroyed in upland habitat in the 160-TAF borrow area, which would not occur under Alternative 1; however, the overall construction footprint within the Los Vaqueros Watershed, and hence the likelihood of encountering moving turtles, would be lower under Alternative 4.

These would be considered significant direct effects of the project. The implementation of Mitigation Measure 4.6.5 would ensure that take is minimized and reduce project effects to a less-than-significant level.

Mitigation Measures

The implementation of Mitigation Measure 4.6.5, which includes biological monitoring and turtle relocation, would reduce project impacts on western pond turtle populations and habitat to a less-than-significant level:

> **Measure 4.6.5:** Before construction activities begin, a qualified biologist[7] shall conduct western pond turtle surveys within creeks and in other ponded areas affected by the project. Upland areas shall also be examined for evidence of nests as well as individual turtles. The project biologist shall be responsible for the survey and for the relocation of turtles. Construction shall not proceed until a reasonable effort has been made to capture and relocate as many western pond turtles as possible to minimize take. However, some individuals may be undetected or enter sites after surveys, and would be subject to mortality. If a nest is observed, a biologist with the appropriate permits and prior approval from CDFG shall move eggs to a suitable location or facility for incubation, and release hatchlings into the creek system the following autumn. In addition, western pond turtles shall be included in the fish rescue operation described in Mitigation Measure 4.3.3 (Alternatives 1 and 2 only).
>
> **Impact Significance after Mitigation:** Less than Significant.

Impact 4.6.6: Project construction under Alternatives 1, 2, and 3 would result in direct and indirect impacts on listed vernal pool fairy shrimp and their habitat, and on the non-listed midvalley fairy shrimp and curved-foot hygrotus diving beetle (Less than Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Vernal pool fairy shrimp are presumed present in all potentially suitable habitat in the project area. Vernal pool fairy shrimp are known from a single rock outcrop in the watershed known as the Kellogg Creek vernal pool complex. The outcrop is about 0.20 mile (1,056 feet) east and upslope from the proposed 275-TAF waterline. This location would not be directly affected by the reservoir inundation or proposed in-watershed facilities (Figure 4.6-5) (ESA, 2004). The USFWS (1995) Conference Opinion used as a BO for the existing Los Vaqueros Reservoir recognized the high sensitivity of the Kellogg Creek vernal pool complex. It required that public use of the

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7 The term “qualified biologist” refers to an individual who has at least a minimum education and qualifications that may include a 4-year degree in a biological sciences or other specific field and training and/or experience surveying, identifying, and handling the subject species. This individual differs from a “Service-approved biologist” in that the qualified biologist may only handle species that are not listed as threatened or endangered by the USFWS. The Service-approved biologist is authorized to relocate such species.

easternmost portion of the watershed be restricted, and that allowable activities at the complex include research and occasional educational activities to be conducted under the immediate supervision of CCWD staff or other responsible parties (USFWS, 1995).

The 1995 BO identified lands just east of the reservoir (i.e., shoreline areas) as suitable for low-intensity dispersed recreational use such as hiking and boat landing (USFWS, 1995). However, CCWD did not develop public access trails or open east-watershed lands to public access. This action negated the requirement to fence the Kellogg Creek vernal pool complex and provide patrols to ensure that no trespassing happens. The proposed eastside trail would provide public hiking access to shoreline areas. Trail construction and public access would not occur within 500 feet of the complex; therefore, direct impacts are not anticipated from trail construction or lawful use of trails. However, use of lands within 200 feet of the complex, which was the threshold established under the 1995 USFWS BO, provides the possibility for trespass and permanent damage to the Kellogg Creek vernal pool complex and vernal pool fairy shrimp populations.

Occupied vernal pool fairy shrimp habitat in the Los Vaqueros Watershed and the Kellogg Creek vernal pool complex would be avoided through planned trail routing, so direct impacts to vernal pool fairy shrimp populations would be avoided. The Kellogg Creek vernal pool complex could be subject to indirect disturbance as a result of recreational users on trails and in the vicinity accessing the area resulting in habitat degradation.

As previously stated, longhorn fairy shrimp and midvalley fairy shrimp are not expected to occur within the Los Vaqueros Watershed.

Suitable habitat for the curved-footed hygrotus diving beetle exists in six stock ponds and 10 created wetlands ponds, and this species is presumed present at these locations. Impacts would not occur to this diving beetle in Kellogg Creek or other flowing drainages. Any populations within the expanded reservoir footprint would be lost. Populations would remain unharmed in features that are drained but not physically altered.

New Delta Intake and Pump Station

Two vernal pool fairy shrimp populations are reported 2 and 4 miles from the new Delta Intake and Pump Station. Longhorn fairy shrimp and midvalley fairy shrimp are not known near this project component. No seasonally ponding habitat lies in or near this study area; therefore, no direct or indirect impacts would occur to vernal pool branchiopods or their habitat at this facility.

Curved-foot hygrotus diving beetles are not described from this area, and are not subject to project impacts.

Delta-Transfer Pipeline

Vernal pool fairy shrimp populations have been identified at distances of 1 to about 3 miles from the Delta-Transfer Pipeline alignment; longhorn fairy shrimp populations have been identified within 5 miles of the alignment. Potential habitat for vernal pool fairy shrimp and possibly midvalley fairy shrimp occurs in a single alkali swale within the project area. The 200-foot-wide pipeline corridor would avoid any known occupied habitat but could affect potential habitat in the alkali swale. Therefore, direct or indirect impacts on potentially occupied vernal pool fairy shrimp and/or midvalley fairy shrimp habitat could occur as a result of Delta-Transfer Pipeline construction.

This alignment does not provide habitat for curved-foot hygrotus diving beetle, thus no impacts would occur to these species.

Expanded Transfer Facility

The Expanded Transfer Facility construction would avoid any known or potential habitat for special-status branchiopods; therefore, no direct or indirect impacts are expected from this project element. This site does not provide habitat for curved-foot hygrotus diving beetles, thus no impacts would occur to this species.

Transfer-LV Pipeline

Much of the Transfer-LV Pipeline alignment is within the watershed. Vernal pool fairy shrimp and longhorn fairy shrimp populations have been identified between 1 to 3 miles from the alignment. Suitable habitat is not present within the alignment or project study area. Therefore, no direct or indirect impacts on fairy shrimp populations or their habitat are expected from Transfer-LV Pipeline construction.

Potential curved-foot hygrotus diving beetle habitat near the pipeline alignment is described for *Los Vaqueros Reservoir Expansion, In-Watershed Facilities, and Recreational Facilities*, above, and includes five created wetland ponds downstream from the dam.

Transfer-Bethany Pipeline

The Transfer-Bethany Pipeline alignment traverses identified vernal pool fairy shrimp habitat and crosses the western portion of critical habitat (Unit 19B) near Byron Airport for a linear distance of 4 miles (CDFG, 2008). The portion of designated critical habitat traversed by the alignment supports at least five topographic depressions that could support vernal pool fairy shrimp, and four additional pools that are occupied by this species (ESA, 2008a). Potential vernal pool fairy shrimp habitat was identified in an additional 7 pools on the alignment that are outside of designated critical habitat for this species. Vernal pool fairy shrimp is presumed present in all potentially suitable habitat for which CCWD chooses not to perform protocol level surveys. The non-listed midvalley fairy shrimp could co-occur with vernal pool fairy shrimp at any of these locations. Therefore, construction of the Transfer-Bethany Pipeline could cause direct and indirect impacts on potential and occupied vernal pool branchiopod habitat.

Habitat for curved-foot hygrotus diving beetles may be present in up to 16 alkali pools that were identified as vernal pool branchiopod habitat.

Indirect Effects to Vernal Pool Hydrology. Direct impacts on vernal pool fairy shrimp habitat are discussed above with direct and indirect impacts to seasonal wetlands and critical habitat addressed in Impact 4.6-2 and 4.6-13, respectively. For the portion of the Transfer-Bethany Pipeline alignment in the vicinity of Byron Airport, this Draft EIS/EIR analyzes potential project effects on surface and subsurface hydrology of vernal pools that occur within and outside the area of direct project effects. As identified in the U.S. Fish and Wildlife Service Vernal Pool Recovery Plan, part of the pipeline alignment falls within one of the Altamont Hills core areas within the Livermore vernal pool region (USFWS, 2005a) (see Impact 4.6-13 for further discussion of effects to designated critical habitat). The purpose of the recovery plan is to incorporate ecosystem considerations through the development and implementation of recovery plans for communities or ecosystems where multiple listed species and species of concern occur, in a manner that restores, reconstructs, or rehabilitates the structure, distribution, connectivity, and function upon which those listed species depend (USFWS, 2005a).

The hydrologic analysis for this Draft EIS/EIR considered whether construction of the Transfer-Bethany Pipeline near Byron Airport could adversely affect local surface or groundwater hydrology, and therefore the functioning of larger vernal pool complexes in the Altamont Hills core area. The concern is whether the proposed buried pipeline and changes to surface topography after backfill would have the potential to impede the movement of water, either surface or groundwater, that supplies local vernal pools. The analysis of the changes to hydrology relied on a literature review of vernal pool hydrology, soil types, topography, and the local hydrology and geologic conditions.

The soil conditions in the area of the Transfer-Bethany Pipeline alignment include the Solano, San Ysidro, Linne, Rincon, and Altamont Series; these are fine-grained, clay-rich soils with slow to very slow permeability. Information obtained from an active groundwater remediation site located near Byron Hot Springs Road and near the proposed pipeline construction area indicate that depth to shallow groundwater (as reported since 1997) has ranged from 8.93 feet below ground surface (bgs) to 23.64 feet bgs. The water capacity, or the capacity of the soils to hold water, ranges from 3.5 to 10 inches of water per inch of soil. The slow permeability rates and water capacity, in conjunction with the relatively flat topography in this area, promote ponding and saturated, perched surface soils, especially after large rainfall events. These conditions result in the formation of vernal pools.

The soil conditions and topography at the site dictate the ability of surface and groundwater to be transmitted throughout this area and therefore determine the ideal conditions for vernal pool formation. Based on a generalized concept of vernal pool hydrology, geologic attributes of vernal pools include a surface soil underlain by a claypan[8], which severely restricts the downward rate of water movement, and surface drainage patterns conducive to pool formation (USFWS, 2005a). The soils underlying the site contain a claypan unit. The water-restricting horizon in the subsurface lithology contributes to the formation of a seasonal water table, or perched aquifer, and when the surface soils are fully saturated, vernal pool inundation begins (Hanes and Stromberg, 1998). Perched aquifer hydraulic gradients during and following precipitation events may play an important role in regulating the period of time during which the vernal pool area is inundated with water (Rains et al., 2006).

8 A claypan is a dense, compact, low permeability layer in the subsoil having a much higher clay content than the overlying material, from which it is separated by a sharply defined boundary. Claypans are usually hard when dry, and plastic when wet and they limit or reduce the downward movement of water through the soil.

Given the known soil types, topography, and local geology, and the presence of a shallow groundwater aquifer, shallow groundwater is not considered a contributor to vernal pool functioning because the shallow groundwater is separated from the surface by the hard, plastic, clay-rich soil horizons, and shallow groundwater near the project area occurs at depths of approximately 9 to 24 feet bgs. Although shallow groundwater flow could be locally impeded in certain areas by the buried pipeline, it would not affect the supply of water to the downgradient vernal pools. The placement of the Transfer-Bethany Pipeline would have a less than significant impact to vernal pool hydrology because shallow groundwater is not considered a contributor to vernal pool inundation and functioning in this area.

However, the surface and perched aquifer hydrology within and downgradient at distances away from the pipeline corridor construction area could be adversely affected by the pipeline construction through alteration of surface topography, and changes in soil infiltration rates in surface soils. If surface topography were not adequately restored following construction, the pipeline could affect hydrology within the construction corridor and downgradient at distances away from the pipeline corridor if the surface flow drainage patterns currently supporting vernal pool formation are altered in such a way that future surface water runoff was routed away from the depressional features where vernal pools are formed. Similarly, changes in soil infiltration rates in surface soils within the approximate 97-acre footprint of the pipeline construction area could alter the perched aquifer hydrology by removing the low permeability claypan soil horizon supporting perched aquifer conditions if downgradient vernal pool areas are hydrologically connected through a continuous claypan soil horizon. It is assumed that the potential impact from changes to perched aquifer hydrology diminish with distance to the depressional features where vernal pools are formed.

Therefore, if the hardpan layer were not appropriately restored following construction, the installation of the Transfer-Bethany Pipeline through this area could have a permanent, direct impact on vernal pools within the pipeline construction corridor and could have indirect effects on downgradient pools through alteration of topography and/or changes to soil infiltration rates in surface soils. If surface topography and groundwater infiltration were not appropriately addressed, these could be potentially significant project effects. The implementation of Measures 4.6.2a and 4.6.2b (wetlands) and Measures 4.6.6a and 4.6.6b (vernal pool fairy shrimp) would reduce the potential for indirect impacts on these areas to a less-than-significant level**.**

Power Supply Infrastructure

Power Option 1: Western Only. No direct or indirect impacts on vernal pool branchiopods or their habitat are anticipated at the Western substation site or powerlines. Curved-foot hygrotus diving beetles are not described from this area, and are not subject to project impacts.

Power Option 2: Western and PG&E. Aquatic habitat that may support fairy shrimp occurs in association with Natural Seasonal Wetlands just north of the Skinner Delta Fish Protective Facility (see Impact 4.6.1 and Figure 4.6-23). This area would be avoided by siting poles away from seasonal wetlands and restricting vehicle access in sensitive areas. Aquatic habitat that may support fairy shrimp was not identified near the proposed PG&E substation and PG&E

distribution line study areas. A handful of alkali pools north of the Skinner Delta Fish Protective Facility provide potential diving beetle habitat and would be spanned by powerlines.

Summary for Alternative 1

Vernal pool fairy shrimp and midvalley fairy shrimp are presumed present in all potentially suitable habitat in the project study area. Under Alternative 1, the project would directly and indirectly impact these species and their habitat during construction of the Delta-Transfer Pipeline, which could impact one potentially occupied pool, and the Transfer-Bethany Pipeline, which would impact 4 occupied pools and 12 potentially occupied pools. No direct impacts to vernal pool branchiopods would occur in the Los Vaqueros Watershed. Recreational use of the eastside trail and unintentional trespass to the Kellogg Creek vernal pool complex could degrade this sensitive vernal pool complex and cause a reduction in habitat quality at this site.

Construction of the Transfer-Bethany Pipeline in the Byron Airport/Armstrong Road area would directly affect vernal pools within the pipeline construction footprint; however, with surface restoration, the installation of the pipeline is not expected to indirectly affect local vernal pool hydrology in pools outside the alignment by altering surface flows, groundwater flow, or infiltration rates, or substantially reducing the quality or extent of the overall vernal pool complex outside the project alignment.

Impacts to curved-foot hygrotus diving beetles could occur in six stock ponds and ten created wetland ponds that would be lost, dewatered, or modified during construction or reservoir inundation. Impacts could also occur at the 16 alkali pools along the Transfer-Bethany Pipeline.

Impacts related to Alternative 1 are significant prior to mitigation, but can be mitigated to a less-than-significant level through implementation of Mitigation Measure 4.6.6a, which serves to avoid potential habitat and restrict post-project public access, and Mitigation Measure 4.6.6b, which provides for cyst salvage and the creation and restoration of vernal pools locally, or the acquisition of credits from local mitigation banks.

Alternative 2

Potential impacts to vernal pool fairy shrimp, midvalley fairy shrimp, and curved-foot hygrotus diving beetles due to project implementation under Alternative 2 would be the same as those discussed for Alternative 1. This would be a potentially significant direct project impact prior to mitigation. Impacts would be reduced to a less-than-significant level through implementation of Mitigation Measures 4.6.6a and 4.6.6b.

Alternative 3

Alternative 3 does not include the Transfer-Bethany Pipeline; therefore, impacts to vernal pool fairy shrimp, midvalley fairy shrimp, and curved-foot hygrotus diving beetles and their habitat would be reduced in comparison to Alternative 1. Impacts would be limited to potential fairy shrimp habitat described in the Alternative 1 for a single pool in the Delta-Transfer Pipeline alignment, and potential for trespass-related impacts in the Los Vaqueros Watershed. Habitat for these species is not present in the area for the Expanded Old River Intake and Pump Station. These constitute a potentially significant direct project impact prior to mitigation. The application of Mitigation Measures 4.6.6a and 4.6.6b would reduce impacts to a less-than-significant level.

Alternative 4

Occupied and potential vernal pool branchiopod habitat would be avoided under this alternative. Thus, no direct or indirect impacts would occur to branchiopod populations. Because the Delta-Transfer and Transfer-Bethany Pipelines are not part of Alternative 4, no impacts are anticipated to vernal pool fairy shrimp, midvalley fairy shrimp, and curved-foot hygrotus diving beetles under Alternative 4, and no mitigation would be required.

Mitigation Measures

The measures proposed below would mitigate impacts to both vernal pool fairy shrimp and midvalley fairy shrimp to a less-than-significant level. The implementation of Measure 4.6.4b, which provides compensation for temporary and permanent impacts to sensitive amphibian habitat in seasonal ponds, would reduce impacts to curved-foot hygrotus diving beetles to a less-than-significant level.

> **Measure 4.6.6a:** CCWD shall assume the presence of listed vernal pool branchiopods in all suitable habitat for which CCWD chooses not to perform protocol-level surveys. Preliminary branchiopod surveys (ESA, 2008a) have documented the general distribution of and habitat for vernal pool fairy shrimp in the project area. Longhorn fairy shrimp are not expected in the project areas based on this species' narrow habitat requirements, restricted range, and available habitat.
>
> CCWD shall minimize impacts on listed vernal pool branchiopods. To avoid and minimize direct and indirect impacts on listed vernal pool branchiopods, standard water quality protection measures shall be implemented as established in Mitigation Measure 4.5.1. Additional measures to minimize and avoid habitat for listed vernal pool branchiopods shall be implemented as required by USFWS and include:
>
> - Avoidance of potential habitat by narrowing work corridors near potential vernal pool branchiopod habitat to the greatest extent practicable.
> - Establishment of 250-foot buffers around potential branchiopod habitat, which is a typical avoidance distance that is recommended by the USFWS to minimize and avoid direct and indirect impacts.
>
> For the Kellogg Creek vernal pool complex the following protection measures shall be implemented:
>
> - Land uses in the easternmost portion of the Los Vaqueros Watershed shall remain restricted to activities associated with wind energy generation, dry-land farming, grazing, and administration by CCWD.
> - East of Los Vaqueros Reservoir, public access shall be restricted from CDFG conservation easement lands at the Kellogg Creek vernal pool complex and lands within

500 feet. Public access shall be restricted to research and occasional educational activities conducted under the supervision of CCWD staff or other designated land management agencies.

- The eastside trail and other public access trails located in proximity to the vernal pool complex shall be 500 feet or farther from the CDFG conservation easement and beyond direct line of sight to rock outcrop features.

- The eastern boundary of the public access area shall be fenced to prevent human access to the vernal pool complex and this fence and the Kellogg Creek vernal pools area shall be patrolled to ensure that no trespassing happens and that the fence remains intact.

- Before opening the eastside trail to public access, a biological evaluation shall be prepared by CCWD that establishes baseline environmental conditions at the vernal pool complex. Elements to be assessed include signs of trespass (e.g., trash, fires, site trampling, wear marks, rocks or other features in pools, or bicycle tire tracks), an evaluation of water quality during winter months to include at a minimum total dissolved solids, pH, and alkalinity, and documentation of any site damage. These conditions will be used as a basis for later site evaluations. An assessment of branchiopod populations shall also be provided as a component of the baseline evaluation.

- If excessive trespass, defined here as noticeable site deterioration relative to baseline conditions, is identified at the vernal pool complex CCWD shall immediately coordinate with USFWS. If site damage is identified, corrective remedies shall be implemented to prevent further harm to the complex. Such actions may include removing trash or debris from the complex, closing portions of the eastside trail to public access, enhancing site fencing, or other remedies to prevent trespass.

- While the eastside trail remains open to public access, annual reports shall be prepared to document site conditions relative to baseline conditions.

- Permanent signage shall be installed within 50 feet of the Kellogg Creek vernal pool complex (or on the surrounding fence) that specifies that, “This area is habitat of the vernal pool fairy shrimp, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment.”

- A USFWS-approved construction monitor shall be present during construction within 0.5 mile of the Kellogg Creek vernal pool complex, as identified in the 1995 BO (USFWS, 1995).

Measure 4.6.6b: CCWD shall mitigate for impacts to vernal pool fairy shrimp habitat through one or more of the following steps to provide compensatory habitat: (a) salvage of cysts and creation of replacement pool habitat in the local area at a replacement ratio of at least 3:1, (b) restoration of affected pools onsite after construction completion, or (c) acquisition of credits from a local mitigation bank(s).

To mitigate for the loss of aquatic sites on the Delta-Transfer Pipeline and Transfer-Bethany Pipeline alignments where vernal pool branchiopods are presumed present, CCWD shall implement the following measures:

- CCWD shall mitigate for the loss of branchiopod habitat that will be filled or otherwise directly affected by the project (estimated to be 17 pools) by providing compensatory habitat.

- For portions of the Transfer-Bethany Pipeline alignment near Byron Airport (e.g., adjacent to Wildlands' Byron Conservation Bank and Contra Costa County lands at Byron Airport) that support vernal pools, CCWD shall conduct a preconstruction land survey of the pipeline construction area to document current conditions of topography and existing drainage patterns, and to document shallow soil lithology within the construction area footprint as a baseline for restoring vernal pool hydrology following construction. In areas where claypan soils are encountered within critical habitat for vernal pool fairy shrimp (and Contra Costa goldfields) the upper clay soil layer shall be locally stockpiled and reestablished in place following pipeline installation. Upon completion of construction activities, final grading shall be completed to maintain surface flow conditions, local hydrology and similar compaction of surface soils to that of the documented current conditions prior to construction activities.

- CCWD shall develop and implement a mitigation, monitoring, and management plan, with input from regulatory agencies that shall outline long-term management strategies and performance standards to be attained to compensate for habitat losses resulting from the project. At a minimum, the plan shall include standards for mitigation site selection and construction specifications for mitigation sites, a description of site conditions including aerial maps, an analysis of local branchiopod habitat, and performance criteria by which site quality can be assessed over time (e.g., size, vegetation species present, date of initial ponding, ponding duration, and wildlife usage). A monitoring program will be established to track the development of habitat conditions that are conducive to the establishment of vernal pool branchiopods.

- To the greatest practicable extent, CCWD or its contractors shall construct compensation habitat (i.e., replacement pools) before habitat disturbances are incurred; or directly within the project footprint after construction. A qualified biologist shall ensure that ponds are functioning as designed.

- CCWD shall submit the name and credentials of a biologist qualified to act as construction monitor to USFWS for approval at least 15 days before construction work begins.

- With concurrence from the USFWS, a USFWS-approved biologist shall salvage soils from sites that are known to support vernal pool branchiopods at least 2 weeks before the onset of construction, or during the preceding dry season if pools are anticipated to hold water when construction begins. The salvaged soil samples will be stored and used to inoculate created pools once minimum performance standards are met at these locations.

- A USFWS-approved biologist shall be present at each active work site within 0.5 mile of potential fairy shrimp habitat until habitat disturbance has been completed. Thereafter, the contractor or CCWD shall designate a person to monitor onsite compliance with all minimization measures. A USFWS-approved biologist shall ensure that this individual receives training consistent with USFWS requirements.

- A USFWS-approved biologist shall conduct a training session for all construction personnel. At a minimum, the training shall include a description of the vernal pool fairy shrimp and their habitat, the importance of these species and their habitat, the general measures that are being implemented to conserve fairy shrimp as they relate to the project, and the boundaries within which the project construction shall occur.

- All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 100 feet from any fairy shrimp habitat.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.7: Project construction would have temporary and permanent impacts on potential San Joaquin kit fox habitat (Less-Than-Significant with Mitigation) and permanently reduce potential regional movement opportunities in one location for this species. (Significant and Unavoidable)

Alternative 1

Grassland habitat in eastern Contra Costa County represents suitable habitat for the San Joaquin kit fox. The loss, fragmentation, and degradation of habitat are considered primary threats to the northern population of San Joaquin kit fox (Orloff et al., 1986). Fragmentation of populations by aqueducts, busy highways, and other obstructions increases isolation, limits dispersal, and reduces genetic flow between populations. Other general threats to kit fox include the application of rodenticides in some areas, either as a direct threat through poisoning or as an indirect threat through reducing the abundance of their prey. Invasion of fragmented habitats by coyotes, red foxes (*Vulpes vulpes*), and feral dogs can also increase kit fox mortality (Ralls and White, 1995). USFWS, CDFG, and resource experts consider all continuous annual grasslands in the watershed and major portions of the proposed pipeline alignment routes as suitable habitat for the San Joaquin kit fox.

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Direct Impacts to Habitat. Grassland habitats would be the primary vegetation community affected by inundation from reservoir expansion. Grasslands are the principal habitat used by San Joaquin kit foxes for denning, foraging, and dispersal, while open oak woodland and coastal scrub provide lower quality foraging habitat but are good for dispersal and cover from predators such as coyotes. CCWD has implemented an intensive schedule of annual kit fox surveys in the watershed since 1998. The only sighting during this period was in September 2008 in close proximity to the Los Vaqueros Watershed Administrative Offices (Howard, pers. comm.).

Reservoir expansion and in-watershed facilities would permanently impact 976.2 acres of annual grasslands habitat and 149.5 acres of oak woodland habitat; both of these habitats are thought to provide kit fox denning, foraging, or dispersal habitat. These acreage figures include land both within and outside of dedicated CDFG kit fox conservation easements. Temporary in-watershed impacts from construction on kit fox habitat would affect up to 45.8 acres of annual grasslands habitat and 28.6 acres of valley foothill woodlands.

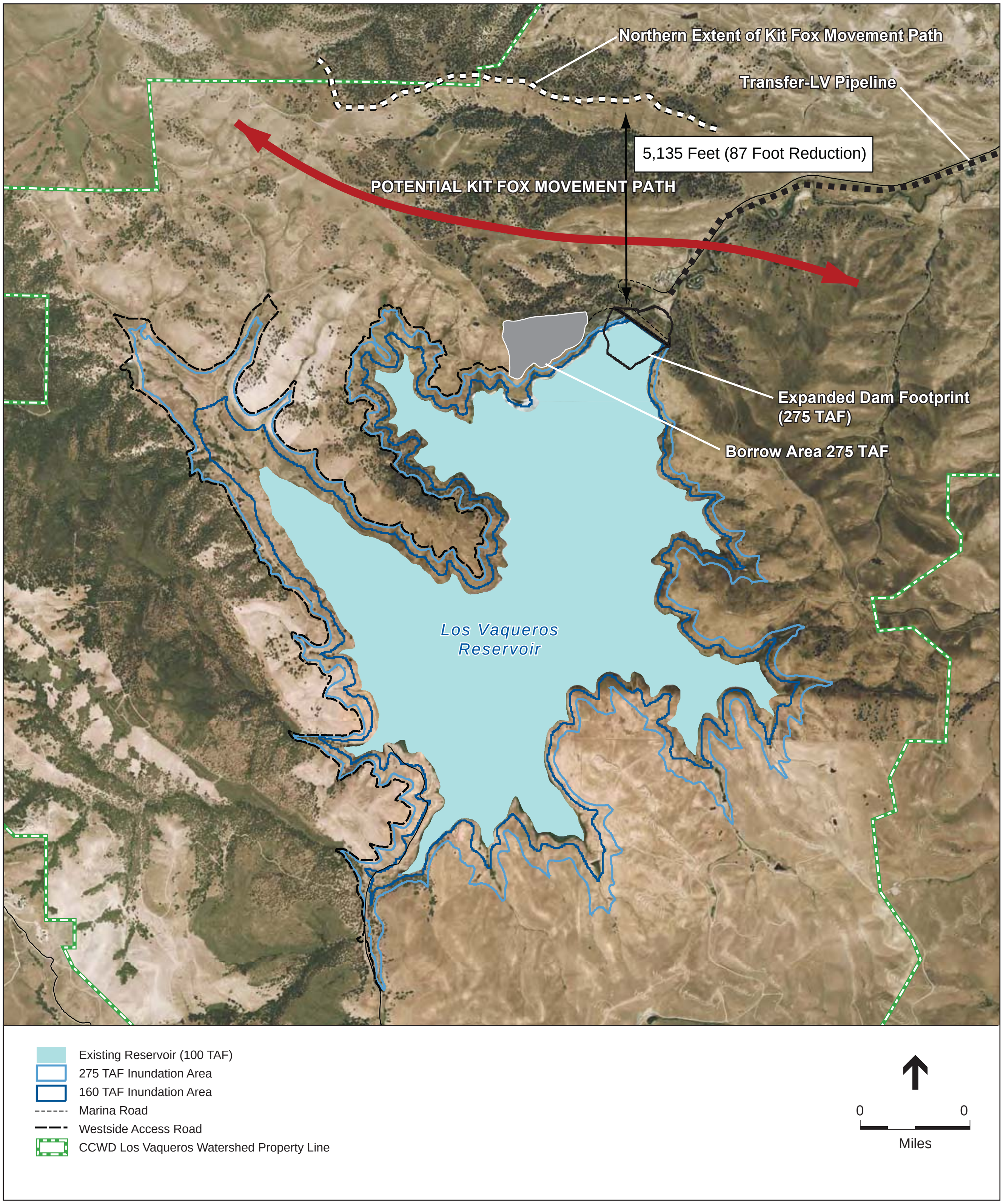
Long-term temporary habitat disturbances in the Inlet/Outlet Pipelines construction area would last a period of at least 2 years during construction of Los Vaqueros Dam and other facilities. During this extended period these areas would be unavailable for kit fox habitation or movement. While these impacts are in essence temporary, during ongoing consultation, CDFG and USFWS have indicated that such long-term habitat disturbances require greater compensation than typically applied for short-term temporary impacts (i.e., greater than a 1.1:1 replacement ratio).

Direct Impacts to Potential Movement Corridors. In 1993, the USFWS acknowledged that construction of the existing Los Vaqueros Reservoir would partially obstruct kit fox dispersal between the Herdlyn watershed (south and east of the reservoir) and Round Valley (north of the reservoir) (USFWS, 1993a). A September 2008 kit fox sighting near the Los Vaqueros Watershed Administrative Offices suggests that the Los Vaqueros Watershed still provides potential dispersal opportunities for regional kit fox movement. Anecdotal observations made around 2006 suggest possible kit fox activity at Round Valley Regional Preserve (Larsen, pers. comm.) with access possibly gained through watershed lands.

Declines in regional San Joaquin kit fox populations have been evident since surveys were initially conducted in the 1960s and 1970s (Jones and Stokes, 1992). While recent distribution data from CDFG, USFWS (unpublished GIS data), and the CNDDB (CDFG, 2008) suggest possible fox populations in the Black Diamond Mines area, near Brushy Peak, and along the eastern fringe of the Altamont Hills, the number of breeding foxes is not known from year to year.

Within the watershed, large tracts of grassland surrounding the reservoir on the north, east, and south have been identified as the some of the most important remaining routes for kit fox movement in the watershed. After reservoir expansion, these movement corridors would remain largely intact. The eastern, northeast and northern sides of the reservoir would continue to provide potential dispersal and cover habitat. This general movement corridor area would remain a link between Round Valley and important kit fox areas south and east of the watershed. The reservoir expansion would incrementally reduce the size of this corridor area north of the reservoir from about 5,222 to 5,135 feet (a distance about 87 feet at its narrowest point) (see **Figure 4.6-24**). This loss of grassland habitat would not restrict potential kit fox dispersal corridors; thus, this effect on potential regional kit fox movement would be less than significant.

The proposed eastside trail would make use of existing roads to the wind power facilities. The new trail segments needed to connect the existing roads for trail continuity would not contribute to the substantial loss of annual grassland habitat available to kit foxes. However, recreational usage of the eastside trail could make this area less attractive to this species. Currently, no public access is allowed on this eastern side of the reservoir. While use of this eastside trail would be expected to be relatively low, similar to the relatively low use of the other existing trails above the reservoir, opening this area to the public could have indirect adverse effects on kit foxes.



SOURCE: USGS, 1993 (base map); CCWD, 2006; CCC, 2007; and ESA, 2007

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Figure 4.6-24
Impacts to the it Fox Movement Corridor
Located Northeast of Los Vaqueros Reservoir

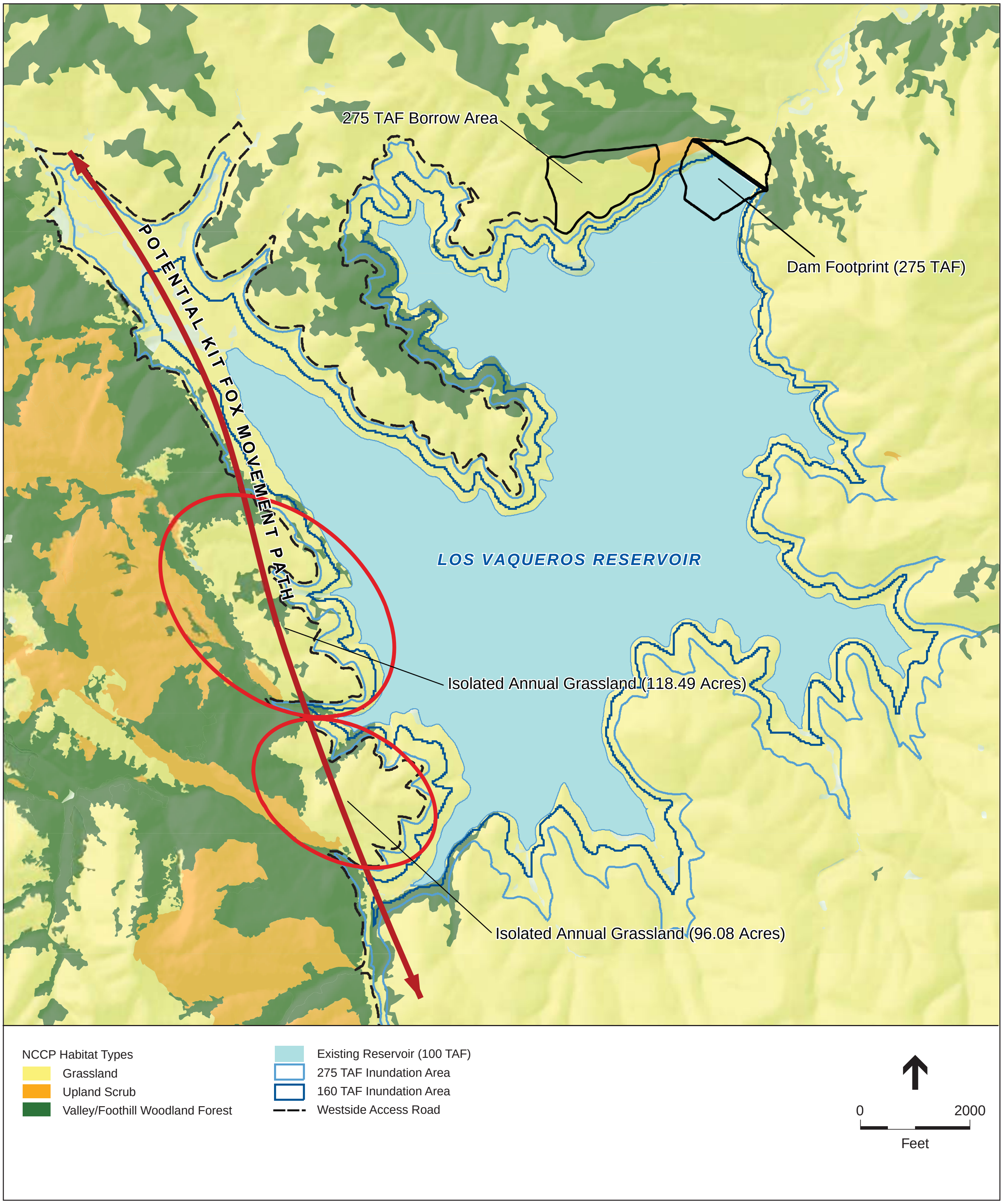
On the western side, reservoir expansion to 275 TAF would inundate the remaining grassland area, thereby eliminating a potential kit fox movement corridor. This area is currently a 1,000- to 2,000-foot-wide strand of annual grasslands, with a few areas of oak woodland intrusion. With reservoir expansion, the waterline would seasonally inundate annual grasslands along this corridor and advance into upslope oak woodland habitat (see **Figure 4.6-25**). Assuming kit foxes use this corridor, the oak woodland habitat would represent a movement barrier for kit foxes. The loss of this potential western movement corridor is considered a potentially significant and unavoidable impact on San Joaquin kit fox movement opportunities.

Mitigation through land acquisition and habitat protection is proposed to preserve and enhance other existing regional movement corridors, particularly those with documented use. However, while this mitigation may preserve effective regional movement corridors for kit fox in the eastern Contra Costa County region, information about kit fox movement in this area is insufficient to confirm that this mitigation would fully lessen the potential effects of reservoir expansion. As a result, this impact to this potential kit fox movement corridor is considered significant and unavoidable.

Indirect Impacts. Three potential indirect impacts on San Joaquin kit fox would result from the project: (1) isolation of annual grasslands on the western side of the reservoir due to inundation, (2) the potential for increased predation of kit fox by coyotes, and (3) habitat disturbances in the Inlet/Outlet Pipelines construction area during construction that, while temporary, could extend for 3 years and render this area unusable as a movement corridor during that period. Concurrent with dam construction, however, the reservoir would be fully drained and dried, opening additional movement opportunities for kit fox in the western portion of the reservoir. These impacts are discussed in the following paragraphs. Some reservoir facilities would require nighttime lighting for safety and security, both during and after construction. Limited nighttime lighting is not expected to have a substantial effect on kit fox populations.

Grassland Isolation. On the western side of Los Vaqueros Reservoir, inundation to the 275-TAF level would raise the waterline into oak woodland habitat along much of the shoreline. Two large grassland areas (118.5 acres and 96.1 acres) would not be inundated or directly affected by the project (see Figure 4.6-25); however, reservoir inundation would isolate these areas from surrounding grasslands and render them inaccessible to kit fox. As a result, the project would contribute to the indirect loss of 214.6 acres of grassland habitat for kit fox habitation and dispersal.

Coyote Predation. Focused surveys performed by CCWD from 1996 through 2007 (CCWD, 2006) and anecdotal evidence (Mueller, pers. comm.) suggest that coyote populations have increased within the watershed since reservoir filling in 1998. The increase in local coyote populations since the mid-1990s could be directly related to land use changes that occurred after creation of the Los Vaqueros Reservoir. Two factors in particular, the increase in anthropogenic food sources for coyotes and the removal of coyote control measures, may have increased competitive pressure on San Joaquin kit foxes within the watershed and in neighboring lands at the Round Valley Regional Preserve and Vasco Caves Regional Preserve. Red foxes and feral dogs have not been identified as a threat to kit foxes in the Los Vaqueros Watershed.



SOURCE: USGS, 1993; CCWD, 2007; MWH, 2007; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-25
Impacts to the it Fox Movement Corridor
West of Los Vaqueros Reservoir

Though coyotes are not documented to eat San Joaquin kit foxes, they have been cited as a main source of kit fox mortality where populations of these species overlap (Cypher and Spenser, 1998; Disney and Spiegel, 1992; Ralls and White et al., 1995) and possibly rank among the greatest threats to kit fox recovery in the watershed. It is suggested that coyotes kill kit foxes to reduce competition for food and other resources, as the two species rely on somewhat similar food items—principally rabbits for coyotes and small rodents for kit fox (White et al., 1994; Cypher and Scrivner, 1992). Thus, lower abundance of coyotes by means of predator control could initiate higher abundance of kit foxes. Without some means of control, it is anticipated that coyote populations would remain stable in the watershed after reservoir expansion. Because coyote populations are expected to remain essentially neutral with or without reservoir expansion, the project is not expected to negatively affect coyote/kit fox interactions.

Long-term Temporary Impacts. Construction of the Inlet/Outlet Pipelines would occur over a 2-year period, rendering this area temporarily unusable as a potential kit fox movement corridor. Concurrent with Los Vaqueros Dam construction, the reservoir would be fully drained and additional kit fox movement opportunities would be temporarily available in the western portion of the reservoir. Thus, the project would temporarily alter kit fox migration pathways in the watershed. It is expected that the reservoir would be completely dry within months after water drawdown and that kit foxes would have a direct overland route across the dry reservoir within 1 to 3 months of draining. This route would require traversing less than a mile of relatively barren mineral soil and dry clay, a significant reduction in travel distances from the Round Valley region to areas south of the Los Vaqueros Reservoir. Kit foxes have been known to travel up to 6 miles in a single day and virtually all their movements occur at night; thus, the lack of cover or refugia features is not expected to decrease the potential use of reservoir areas for overland migration. This route would be available during construction of the Inlet/Outlet Pipelines. As a result, construction of the reservoir Inlet/Outlet Facilities is not expected to contribute additional indirect impacts to kit fox.

New Delta Intake and Pump Station

The new Delta Intake and Pump Station site is on the eastern fringe of the San Joaquin kit fox range, and the area provides marginal habitat for kit foxes (USFWS, unpublished data; see Figure 4.6-10). Based on their known range and available habitat near the Delta Intake Facilities, kit foxes may be encountered in this area during construction.

Delta-Transfer, Transfer-LV, and Transfer-Bethany Pipelines

Each of the proposed pipeline alignments generally support annual grasslands and oak woodland habitat that provide potential moderate to high quality San Joaquin kit fox denning, foraging, and dispersal habitat. Virtually all grasslands and oak woodland habitat in these alignments are believed to provide habitat benefits and values for kit foxes. The alignments are generally described below and impacts to them are presented in **Table 4.6-13**:

- The Delta-Transfer Pipeline alignment west of SR 4 is thought to provide at least moderate quality dispersal and denning habitat for San Joaquin kit fox.

TABLE 4.6-13
SUMMARY OF IMPACTS ON SAN JOAQUIN KIT FOX HABITAT ALONG PIPELINE ALIGNMENTS

Pipeline	Length (miles)	Habitat Usage	Temporary Impacts on Grassland Habitat (acres)	Permanent Impacts
Delta-Transfer	6.8	Potential denning, foraging, and dispersal habitat	39.4	Limited to vaults, manholes, blow-off valves, or vents along the pipeline alignment
Transfer-LV	4.3	Potential denning, foraging, and dispersal habitat	76.5	
Transfer-Bethany	7.7 (excludes southern tunnel/pipeline segment)	Moderate to high quality dispersal and denning	150.9	

SOURCE: ESA unpublished data, 2006-2008

- The Transfer-LV Pipeline alignment traverses moderate quality annual grasslands that are subject to ongoing disturbances from watershed management and recreational activities.
- The Transfer-Bethany Pipeline alignment traverses the eastern kit fox dispersal corridor where kit foxes have been sighted in recent years (CDFG, 2008; USFWS file data). This area is assumed to provide high quality habitat for this species.

Permanent habitat impacts would be limited because the pipelines would be mostly below-grade and areas would be restored after construction. The extent of habitat that would be permanently affected by installation of the access vaults, blow-off valves, or vents along the pipeline alignments is minimal (less than 0.5 acre total based on existing pipelines). The pipeline facilities are not anticipated to affect long-term San Joaquin kit fox movements or population distribution. Other than these features, pipelines would not have permanent habitat impacts.

Expanded Transfer Facility

Construction at the Expanded Transfer Facility site would permanently impact 1.2 acres of low quality annual grasslands habitat that could be used by San Joaquin kit fox. This area is presently surrounded with security fencing that inhibits kit fox access, and is ungrazed and supports tall, extremely dense herbaceous vegetation, principally mustards, that is considered sub-optimal as kit fox habitat.

Existing Mitigation Commitments

At present, 4,150 acres of land in the watershed have been conveyed to CDFG as a kit fox conservation easement, and 1,856 acres have been proposed to be conveyed (see Figure 4.6-14). Under Alternative 1, reservoir expansion would permanently inundate 372.4 acres of annual grasslands, 40.7 acres of valley foothill woodland and riparian habitat, and 0.4 acre of upland scrub within existing conservation easements for San Joaquin kit foxes. Another 67.9 acres of grasslands habitat within kit fox conservation easements would be permanently impacted to accommodate the borrow area (37.8 acres), dam (4.6 acres), westside access road (23.3 acres), and other parking, picnic, and road facilities (2.1 acres). These facilities would also permanently affect 9.1 acres of woodland and riparian forest habitat and 6.2 acres of upland scrub habitat within conservation easements.

Owing to construction, temporary impacts within kit fox conservation easements would total an additional 35.8 acres and include 31 acres of annual grasslands (up to 20.0 acres in the Inlet/Outlet Pipelines construction area; 11.0 acres for the westside access road; and 1.0 acre for other parking, picnic, and road facilities), 3.8 acres of woodland habitats, and 0.3 acre of upland scrub habitat.

Indirect impacts on San Joaquin kit fox CDFG conservation easements are anticipated on the western side of Los Vaqueros Reservoir, where inundation to the 275-TAF level places the reservoir shoreline waterline directly against oak woodland habitat, thereby isolating annual grasslands that would not be inundated (see Figure 4.6-25). The overall conservation value of these isolated areas would be substantially reduced as dedicated conservation lands because reservoir inundation would isolate these features from surrounding grasslands, potentially making them inaccessible to kit foxes. As a result, the project would cause the indirect reduction in conservation value to 214.6 acres of grassland habitat.

Power Supply Infrastructure

Power Option 1: Western Only. The Western study area is on the eastern edge of the San Joaquin kit fox range, and provides moderate to good quality habitat for this species. Impacts from powerlines would be minimal, with temporary habitat impacts during construction.

The Western substation would permanently affect 2.0 acres of annual grasslands habitat within the active range of the kit fox. The permanent access road to the substation facility, most likely from Camino Diablo Road, would likely use existing road easements with minimal habitat impacts.

Power Option 2: Western and PG&E. The PG&E substation would affect an estimated 2 acres of moderate to good quality annual grasslands habitat that may be used by kit foxes. Impacts from powerlines would be minimal.

As identified for Option 1, impacts from powerlines would be minimal in the Western powerline alignment.

Summary for Alternative 1

Under Alternative 1, the project would directly and indirectly impact San Joaquin kit fox habitat in several locations and permanently reduce potential regional movement opportunities in one location. The greatest habitat impact in terms of vegetation occurs to the grassland vegetation community, which provides potential kit fox denning, foraging, and dispersal. To a lesser degree, dispersal and coverage habitat provided by oak woodlands and coastal scrub would also be impacted. A potential movement corridor would be eliminated on the west side of the reservoir after inundation. Indirect effects include grassland isolation, risk for increased competition by coyotes, and sustained habitat disturbances related to project construction. Many of these impacts would occur on lands that currently are subject to kit fox mitigation easements.

Impacts related to Alternative 1 would be significant prior to mitigation, but most can be mitigated to a less-than-significant level through protection measures and incorporation of onsite and offsite compensatory mitigation. Loss of a potential movement corridor on the western side of the reservoir remains a significant project effect that cannot be mitigated. Alternative 1 impacts would be reduced through implementation of Mitigation Measure 4.6.7a, which serves to identify kit fox in the area and protect them during project construction; Mitigation Measure 4.6.7b, which provides for the acquisition and dedication of lands into conservation easements or the purchase of mitigation credits; and Mitigation Measures 4.6.7c, which requires acreage replacement within the watershed.

Alternative 2

Potential impacts to San Joaquin kit fox, their habitat, and migration opportunities under Alternative 2 would be the same as those discussed for Alternative 1. As a result, Alternative 2 would have significant direct and indirect impacts before mitigation. After the implementation of Mitigation Measures 4.6.7a, 4.6.7b, and 4.6.7c, most impacts to San Joaquin kit foxes would be mitigated to a less-than-significant level; however, the loss of the western movement corridor presents a significant unavoidable impact to potential San Joaquin kit fox migration pathways.

Alternative 3

Under Alternative 3, potential impacts to San Joaquin kit foxes within the watershed would be the same as those described for Alternative 1. The reservoir would be expanded to the same 275 TAF capacity and have the same in-watershed footprint as under Alternative 1.

Because Alternative 3 does not include the Transfer-Bethany Pipeline, potential temporary impacts to moderate to high quality kit fox dispersal and denning habitat would not occur in this area. In the absence of the 7.7-mile pipeline alignment (and 1.4-mile to 2.2 mile tunnel/pipeline) this alternative would impact at least 150.9 fewer acres of grasslands habitat suitable for kit fox compared to Alternative 1.

Expansion of the Old River Intake and Pump Station proposed under this alternative would not involve any physical site changes modification or disturbance either on the land or in the water. Therefore there would be no impact to kit fox at this site.

These impacts constitute significant direct and indirect impacts to San Joaquin kit fox and their habitat before mitigation. After the implementation of Mitigation Measures 4.6.7a through 4.6.7c, most impacts to the San Joaquin kit fox would be mitigated to a less-than-significant level. As with Alternatives 1 and 2, the loss of the western movement corridor would constitute a significant, unavoidable impact of Alternative 3.

Alternative 4

Direct Impacts to Habitat

Direct habitat impacts to San Joaquin kit fox habitat under Alternative 4 would be less than under Alternative 1. The 160 TAF reservoir expansion would permanently impact 498.5 acres of annual grasslands habitat and 22.1 acres of oak woodland habitat; both of these habitats are thought to provide potential kit fox denning, foraging, or dispersal habitat. These acreage figures include land both within and outside of dedicated CDFG kit fox conservation easements.

Alternative 4 does not include the Delta-Transfer Pipeline, Transfer-Los Vaqueros Pipeline, or Transfer-Bethany Pipeline; therefore, potential temporary impacts to moderate to high quality kit fox dispersal and denning habitat would not occur in these areas. In the absence of these pipeline alignments, this alternative would impact roughly 266.8 fewer acres of annual grasslands habitat than Alternative 1 (Table 4.6-13).

The 160-TAF borrow area is in a relatively level area west of Kellogg Creek that provides a potential movement corridor for kit fox. Long-term temporary habitat impacts would occur in an area measuring about 16.5 acres (600 feet by 1,200 feet) where soils would be excavated to a depth of about 10 feet. After soil removal, the borrow area would be replanted to annual grasslands.

Direct Impacts to Potential Movement Corridors

Reservoir expansion to 160 TAF would not significantly affect the large tracts of grassland surrounding the reservoir on the north, east, and south that serve as potential routes for kit fox movement through the watershed. After reservoir expansion, these movement corridors would remain largely intact. The eastern and northern sides of the reservoir would continue to provide potential dispersal and cover habitat. This general movement corridor area would remain a link between Round Valley and important kit fox areas south of the watershed. The eastern-northern movement corridor would be reduced less than 50 feet in width under Alternative 4, from an estimated 5,222 feet at the narrowed point to 5,172 feet after reservoir expansion (Figure 4.6-24). If kit fox movement opportunities are currently presumed in this corridor, the incremental narrowing of suitable habitat is not expected to appreciably affect the continued use of this area.

On the western side of the reservoir, reservoir expansion to 160 TAF would inundate some of the remaining grassland area that represents a potential kit fox movement corridor. As shown on Figure 4.6-24, the 160-TAF reservoir would inundate less of this grassland area than the 275-TAF reservoir, such that more grasslands would remain. However, inundation would effectively eliminate this area as a kit fox movement corridor. After expansion to the 160-TAF level, the waterline would abut the edge of oak woodland habitat and, assuming kit fox can presently use this corridor, would present a movement barrier for kit fox.

Mitigation through land acquisition and habitat protection is proposed to preserve and enhance other existing regional movement corridors, particularly those with documented use. However, while this mitigation may preserve effective regional movement corridors for kit fox in the eastern

Contra Costa County region, information about kit fox movement in this area is insufficient to confirm that this mitigation would fully lessen the potential effects of reservoir expansion.

Existing Mitigation Commitments

Reservoir expansion under Alternative 4 would permanently inundate 150.3 acres of annual grasslands and 20.7 acres of valley foothill woodland and riparian habitat that are within existing conservation easements for San Joaquin kit fox (Figure 4.6-14). Similar to Alternative 1, additional grasslands habitat within kit fox conservation easements, totaling about 67 acres, would be permanently affected to accommodate the borrow area, dam, and other facilities.

Indirect impacts on a San Joaquin kit fox CDFG conservation easement are anticipated on the western side of Los Vaqueros Reservoir, where the 160-TAF waterline would be next to oak woodland habitat, and would consequently isolate annual grasslands that would not be inundated (see Figure 4.6-23). The overall conservation value of these dedicated kit fox conservation easement lands would be reduced because they would be essentially isolated from surrounding grasslands and inaccessible to some wildlife species, including San Joaquin kit fox. As a result, the project would cause the indirect reduction in conservation value to 301.4 acres of grassland habitat. Note that indirect impacts are higher under Alternative 4 than under Alternative 1 because, while total inundation of grasslands is less under Alternative 4, a greater amount of remaining grassland acreage would become isolated west of the reservoir.

Summary

Direct habitat impacts under Alternative 4 would be less than under Alternative 1 due to the exclusion of the Transfer-Bethany, Delta-Transfer, and Transfer-Los Vaqueros Pipelines. With the absence of these features the project would impact 266.8 fewer acres of annual grassland habitat. Under Alternative 4, the project would impact fewer acres of annual grasslands (498.5 acres, versus 976.2 acres under Alternative 1) and oak woodlands habitat (20.7 acres, versus 81.1 acres under Alternative 1) that may be used by kit foxes. Both Alternatives 1 and 4 effectively eliminate the western side of the reservoir as a kit fox movement corridor.

Alternative 4 has greater indirect impacts to kit fox conservation lands west of the reservoir because more non-inundated grasslands would become inaccessible to kit fox (301.4 acres) compared with Alternative 1 (214.6 acres). Fewer indirect impacts would occur to these conservation areas under Alternative 1 (i.e., less grasslands would be isolated); however, more conservation lands would be directly inundated, producing a similar overall effect on kit fox habitat availability. Prior to mitigation, Alternative 4 would have significant direct and indirect impacts on San Joaquin kit fox and their habitat. After Mitigation Measures 4.6.7a through 4.6.7c are implemented, most impacts to San Joaquin kit fox would be mitigated to a less-than-significant level. As with the other alternatives, Alternative 4 would cause the loss of the western movement corridor, which would constitute a significant, unavoidable impact to the potential San Joaquin kit fox movement corridor.

Mitigation Measures

Measure 4.6.7a: CCWD shall implement San Joaquin kit fox protection measures. The following measures, which are intended to reduce direct and indirect project impacts on San Joaquin kit foxes, are derived from the *San Joaquin Kit Fox Survey Protocol for the Northern Range* (USFWS, 1999a) and the *Standardized Recommendations for Protection of the San Joaquin Kit Fox* (USFWS, 1999b). These measures shall be implemented for construction areas along pipeline corridors, staging areas, and facilities within the watershed:

- Preconstruction surveys shall be conducted within 200 feet of work areas to identify potential San Joaquin kit fox dens or other refugia in and surrounding workstations. A qualified biologist shall conduct the survey for potential kit fox dens 14 to 30 days before construction begins. All identified potential dens shall be monitored for evidence of kit fox use by placing an inert tracking medium at den entrances and monitoring for at least 3 consecutive nights. If no activity is detected at these den sites, they shall be closed following guidance established in USFWS Standardized Recommendations document.

- If kit fox occupancy is determined at a given site, the construction manager should be immediately informed that work should be halted within 200 feet of the den and the USFWS contacted. Depending on the den type, reasonable and prudent measures to avoid effects to kit foxes could include seasonal limitations on project construction at the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence.

- To minimize the possibility of inadvertent kit fox mortality, project-related vehicles shall observe a maximum 20 miles per hour speed limit on private roads in kit fox habitat. Nighttime vehicle traffic shall be kept to a minimum on nonmaintained roads. Off-road traffic outside the designated project area shall be prohibited in areas of kit fox habitat.

- To prevent accidental entrapment of kit fox or other animals during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, fenced, or escape routes constructed of earthen materials or wooden planks shall be provided. Before filling, such holes shall be thoroughly inspected for trapped animals.

- All food-related trash items (such as wrappers, cans, bottles, and food scraps) shall be disposed of in closed containers and removed daily from the project area.

- To prevent harassment and mortality of kit foxes or destruction of their dens, no pets shall be allowed in the project area.

Measure 4.6.7b: To compensate for impacts on San Joaquin kit fox habitat outside of dedicated CDFG conservation easements, CCWD shall provide mitigation either through acquiring and dedicating lands into conservation easements or purchasing mitigation credits at compensation ratios that have been approved by state and federal resource agencies.

Consistent with MSCS and USFWS guidance, mitigation ratios applied for impacts on San Joaquin kit fox habitat shall be 1:1 to 1.1:1 for temporary impacts; 1:1 to 2:1 for long-term temporary impacts; and 1:1 to 3:1 for permanent impacts. CCWD shall acquire San Joaquin kit fox mitigation lands based on anticipated impacts to suitable habitat and mitigation ratios identified by the MSCS and USFWS (see **Table 4.6-14**).

San Joaquin kit fox mitigation obligations may concurrently satisfy burrowing owl mitigation obligations identified in Mitigation Measure 4.6.8, below, if suitable habitat is present for both species in mitigation lands. The availability of mitigation lands to satisfy mitigation requirements for these species is discussed in the Comprehensive Biological Resources Mitigation and Compensation Program (Section 4.6.3).

Measure 4.6.7c: CCWD shall replace any acreage of existing kit fox easement affected by the project with an equivalent amount of acreage within the watershed to maintain under conservation easement the full amount required for the original Los Vaqueros Reservoir Expansion Project. In addition, CCWD shall provide compensation for conservation easement acreage affected at a ratio of up to 3:1, including conservation easement lands that are isolated by the project (see Table 4.6-14). Compensation for temporary impacts to lands within conservation easements shall be provided at a ratio of 1:1 to 1.1:1.

Impact Significance after Mitigation: Less than significant for habitat impacts except loss of the potential movement corridor on the western side of the reservoir, which would remain a significant and unavoidable effect of the project under all project alternatives. Although the proposed mitigation program includes acquisition of habitat acres to compensate for the grassland acres affected by reservoir expansion, and the program also proposes acquisition of compensatory habitat in areas that preserve remaining movement corridors for the kit fox, these measures would not reduce or avoid the loss of the grassland along the western side of the reservoir. The loss of most of this grassland strip to inundation and therefore of this specific potential movement corridor is unavoidable.

Impact 4.6.8: Project construction would result in temporary and permanent loss of habitat for burrowing owl. (Less-Than-Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Construction activities related to the expansion of the Los Vaqueros Reservoir, access roads, and recreational facilities (e.g., trails and picnic areas) would require grading and excavation of 1,022.0 acres of California annual grasslands and purple needlegrass grasslands. Most temporary impacts (45.8 acres) would occur during project construction, whereas the permanent impact (976.2 acres) would occur when the reservoir is filled. The proposed reservoir footprint is in or next to potential burrowing owl breeding and nonbreeding habitat, and is considered to provide varying degrees of habitat quality for this species. Focused owl surveys have not been conducted to document the local distribution of this species near the reservoir, but nonbreeding owls are documented in the area and should be presumed present in all potentially suitable grassland habitats. Burrowing owls in this area would be exposed to direct and indirect project impacts.

TABLE 4.6-14
SUMMARY OF SAN JOAQUIN KIT FOX HABITAT IMPACTS

	HABITAT IMPACTS (ACRES)						
	Impacted Nonconservation Lands			**Impacted CDFG Kit Fox Conservation Lands**			
	Temporary	**Long-Term Temporary**[c]	**Permanent**	**Temporary**	**Long-Term Temporary**	**Permanent**	**Isolated SJKF Grasslands**
Alternatives 1 and 2							
Grassland Impacts							
In-watershed	15,8	0.0	535.9	11.0	20.0	440.3	214.6
Out-of-watershed	266.8	0.0	1.2	0.0	0.0	0.0	0.0
Subtotal	282.6	0.0	537.1	11.0	20.0	440.3	214.6
Total Alternative 1 and 2 Grassland Impact: 1,505.6 acres							
Mitigation Ratios	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 3:1
Grasslands Compensation Acreage	282.6 to 310.9	0.0	537.1 to 1,611.3	11.0 to 12.1	20.0 to 40.0	440.3 to 1,320.9	214.6 to 643.8
Alternative 1 and 2 Grassland Mitigation Requirement: 1,505.6 to 3,939.0 acres							
Alternative 3							
Grassland Impacts							
In-watershed	15.8	0.0	535.9	11.0	20.0	440.3	214.6
Out-of-watershed	115.9	0.0	1.2	0.0	0.0	0.0	0.0
Subtotal	131.7	0.0	537.1	11.0	20.0	440.3	214.6
Total Grassland Impact : 1,354.7 acres							
Mitigation Ratios	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 3:1
Grasslands Compensation Acreage	131.7 to 144.9	0	537.1 to 1,611.3	11.0 to 12.1	20.0 to 40.0	440.3 to 1,320.9	214.6 to 643.8
Alternative 3 Grassland Mitigation Requirement: 1,354.7 to 3,773.0 acres							
Alternative 4							
Grasslands							
In-watershed	19.2	0.0	348.2	0.0	0.0	150.3	301.4
Out-of-watershed	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	19.2	0.0	348.2	0.0	0.0	150.3	301.4
Total Grassland Impact : 819.1 acres							
Mitigation Ratios	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 3:1
Grasslands Compensation Acreage	19.2 to 21.1	0.0	348.2 to 1,044.6	0.0	0.0	150.3 to 450.9	301.4 to 904.2
Total Grassland Mitigation Requirement: 819.1 to 2,420.8 acres							

a "Long-term temporary" impacts are distinguished from temporary and permanent impacts to describe temporary habitat disturbances with a duration lasting longer than one growing season. Permanent impacts, as used in this section, are those that would permanently alter the landscape with no return to pre-project conditions. The USFWS generally considers "long-term temporary" effects (i.e., effects with a duration of greater than one growing season) as a permanent impact.

Burrowing owls are considered to have patchy, disjunctive distribution in the regional project vicinity. Where present, they often occur in large numbers. For example, sizeable groups of burrowing owl were noted in an approximately 100-acre area near Brushy Creek at Dyer Road (up to 14 pairs) as well as at a second site about 5 miles east of Dyer Reservoir, where J. Barclay (unpubl. data) recorded up to seven owl pairs around the perimeter of a 140-acre site. No records from CCWD or the CNDDB note burrowing owl colonies or aggregations in or near the reservoir expansion footprint.

Expansion of the reservoir would indirectly affect burrowing owls through the loss of habitat (foraging, roosting, and wintering habitat). Construction and earthmoving activities could affect burrowing owls through direct mortality of adults or nestlings if nest burrows are in areas where the soil is disturbed. Construction activities could also affect nesting burrowing owls by disrupting adult reproductive behavior if owl pairs were nesting within 500 feet of construction during the nesting season (March–June).

New Delta Intake and Pump Station

Although upland agricultural areas in the Delta Intake and Pump Station vicinity might theoretically be used by burrowing owls for foraging, and the levees could support burrows as nesting habitat, no known burrowing owl nesting habitat lies within 500 feet of the study area vicinity. Based on the known distribution of this species and preliminary reconnaissance survey findings, construction and operations of the Delta Intake and Pump Station are not expected to directly or indirectly affect burrowing owls.

Delta-Transfer, Transfer-LV, and Transfer-Bethany Pipelines

The Delta-Transfer Pipeline alignment traverses cropland and grassland habitat, and the Transfer-LV and Transfer-Bethany Pipelines would traverse grassland habitat that might be used by burrowing owl for foraging and breeding. During reconnaissance surveys in spring 2007, biologists identified high quality burrowing owl nesting and foraging habitat along the length of each of the pipeline alignments. **Table 4.6-15** summarizes known occurrences and potential impacts that construction of each pipeline would have on burrowing owls and their habitat. Active burrowing owl nests and satellite burrows have not been detected along the various alignments.

Expanded Transfer Facility

The Expanded Transfer Facility site is near tall grasslands habitat that likely is not used by burrowing owls, although the tall grassland should be considered potentially occupied habitat. Burrowing owls are not known to occur near the Transfer Facility. Construction-related impacts on this species would include temporary disturbance of grassland habitat, which would be restored with native vegetation after construction is completed. Permanent impacts would include the loss of 1.22 acres of grassland habitat associated with the balancing reservoir. Permanent direct impacts on burrowing owls are not expected from this facility.

TABLE 4.6-15
SUMMARY OF BURROWING OWL OCCURRENCES AND POTENTIAL IMPACTS

Pipeline	Length (miles)	CNDDB Occurrences	Reconnaissance Survey	Potential Impacts
Delta-Transfer	6.8	None documented within 500 feet	None observed	Likelihood of direct impacts is considered low to moderate due to agricultural activities. Habitat usage is considered minimal.
Transfer-LV	4.3	None documented within 500 feet	None observed	Likelihood of direct impacts is considered low to moderate due to high vehicle traffic and recreational usage. Habitat usage is considered minimal.
Transfer-Bethany	8.5	None documented within 500 feet, several documented in areas greater than 500 feet	None observed	Likelihood of direct impacts is moderate to high due to high quality annual grasslands habitat.

SOURCE: ESA 2008

Power Supply Infrastructure

Power Option 1: Western Only. Impacts from powerlines would be minimal, with temporary habitat impacts during construction.

The Western substation would permanently impact 2 acres of annual grasslands habitat in an area that does not support owl breeding. Though not previously identified from the area, the permanent access road to the substation facility may support burrowing owl breeding; thus, road construction may cause temporary habitat impacts to this species.

Power Option 2: Western and PG&E. A pair of breeding burrowing owls was identified in the Power Option 2 Western powerline alignment during spring 2008 reconnaissance surveys, and the corridor provides patches of moderate quality burrowing owl nesting habitat (B. Pittman, pers. obs.). Impacts from powerlines would be minimal, with temporary habitat impacts during construction.

Burrowing owls have not been identified at the PG&E substation or within the powerline alignment, and based on reconnaissance surveys are not expected in the study area.

Existing Mitigation Commitments

No burrowing owl mitigation commitments have been established for the Los Vaqueros Reservoir Expansion Project.

Summary for Alternative 1

Under Alternative 1, the project would directly impact burrowing owls and their habitat through grading and excavation of grasslands and reservoir inundation. Grading and excavation constitute temporary impacts to 45.8 acres, and 976.2 acres would be permanently impacted when the reservoir is filled. This species could also be encountered at virtually any location on the Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline. Impacts related to Alternative 1 would be significant prior to mitigation. Alternative 1-related impacts would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.8a, which provides for surveys and protection measures during construction; and Mitigation Measure 4.6.8b, which provides compensation for impacts through land acquisition and dedication to a conservation easement and/or participation in a mitigation bank.

Alternative 2

Potential impacts to the burrowing owl and its habitat due to project implementation under Alternative 2 would be the same as those discussed for Alternative 1, and constitute a significant impact prior to mitigation. Alternative 2-related impacts would be reduced to a less-than-significant level through implementation of Mitigation Measures 4.6.8a and 4.6.8b.

Alternative 3

Potential impacts to the burrowing owl and its habitat due to project implementation under Alternative 3 would be similar to those discussed for Alternative 1 within the reservoir and along the Delta-Transfer pipeline, the Transfer-LV pipeline, and the electrical transmission facilities. However, overall impact to this species would be less because this alternative does not include construction of the Transfer-Bethany Pipeline, which would affect moderate to high quality burrowing owl habitat. Alternative 3 would therefore impact at least 150.9 fewer acres of grasslands habitat compared to Alternative 1, and the likelihood of encountering burrowing owls on the project would be reduced.

The Expanded Old River Intake and Pump Station would be constructed within the existing facilities footprint; therefore, no permanent impacts would occur on any upland burrowing owl foraging habitat. Based on the known distribution of this species and preliminary reconnaissance survey findings, construction and operations of the Expanded Old River Intake and Pump Station are not expected to directly or indirectly affect burrowing owls. No impacts are anticipated at this site.

Potential direct and indirect impacts to burrowing owls within the Los Vaqueros Watershed and on the Delta-Transfer Transfer-LV pipeline alignments are considered significant before mitigation. The implementation of Mitigation Measures 4.6.8a and 4.6.8b would reduce these potential impacts to a less-than-significant level.

Alternative 4

Grasslands in the reservoir footprint are considered to provide potential foraging, roosting, and wintering habitat for burrowing owl. These areas provide varying degrees of habitat quality for this species and many areas are not considered suitable for owl breeding. Construction activities related to 160-TAF reservoir expansion would permanently impact 498.5 acres of annual grasslands habitat, compared with 976.2 acres under Alternative 1. Focused owl surveys have not been conducted to document the local distribution of this species near the reservoir, but this species is routinely documented in the area and should be presumed present in all potentially suitable grassland habitats. Burrowing owls in this area would be exposed to direct or indirect project impacts from construction and reservoir inundation.

The 16.5 acre 160-TAF borrow area, which is unique to Alternative 4, provides low quality burrowing owl nesting habitat due to its low density of ground squirrel activity; however, this area is excellent foraging habitat for burrowing owls.

Direct and indirect impacts to burrowing owl under Alternative 4 are considered significant before mitigation. The implementation of Mitigation Measures 4.6.8a and 4.6.8b would reduce these potential impacts to a less-than-significant level.

Mitigation Measures

The implementation of Mitigation Measure 4.6.8a, which requires preconstruction surveys and protection measures to avoid burrowing owls during the breeding season, and Measure 4.6.8b, which includes the establishment of mitigation lands for loss of habitat as required by regulatory permits, would reduce potential impacts on burrowing owls to a less-than-significant level.

> **Measure 4.6.8a:** CCWD shall implement the measures listed below for grassland habitats to reduce potential impacts to a less-than-significant-level and to avoid incidental take of burrowing owls. In advance of construction, CCWD shall follow the current CDFG burrowing owl survey guidance, presently the Burrowing Owl Consortium multi-phase approach to evaluate burrowing owl use. Measures shall apply to all construction activities near active nests or within potential burrowing owl nesting habitat, to avoid, minimize, or mitigate impacts on burrowing owls:
>
> *Breeding season surveys* shall be performed to determine the presence of burrowing owls for the purposes of inventory, monitoring, avoidance of take, and determining appropriate mitigation. In California the breeding season begins as early as February 1 and continues through August 31. Under the Burrowing Owl Consortium's multi-phase survey methodology, for areas within 500 feet of construction boundaries, CCWD shall: 1) perform a habitat assessment to identify essential components of burrowing owl habitat, including artificial nest features; 2) perform intensive burrow surveys in areas that are identified to provide suitable burrowing owl habitat, and; 3) perform at least four appropriately-timed breeding season surveys (four survey visits spread evenly [roughly every 3 weeks] during the peak of the breeding season, from April 15 to July 15) to document habitat use.
>
> *Pre-construction surveys* shall be used to assess the owl presence before site modification is scheduled to begin. Initial pre-construction surveys should be conducted outside of the

owl breeding season (February 1–August 31), but as close as possible to the date that ground-disturbing activities will begin. Generally, initial pre-construction surveys should be conducted within 7 days, but no more than 30 days prior to ground-disturbing activities. Additional surveys may be required when the initial disturbance is followed by periods of inactivity or the development is phased spatially and/or temporally over the project area. Up to four or more survey visits performed on separate days may be required to assure with a high degree of certainty that site modification and grading will not take owls. The full extent of the pre-construction survey effort shall be described and mapped in detail (e.g., dates, time periods, area[s] covered, and methods employed) in a biological report that will provided for review to CDFG.

In addition to the above survey requirements, the following measures shall be implemented to reduce project impacts to burrowing owls:

- Construction exclusion areas (e.g., orange exclusion fence or signage) shall be established around occupied burrows, where no disturbance shall be allowed. During the nonbreeding season (September 1 through January 31), the exclusion zone shall extend at least 160 feet around occupied burrows. During the breeding season (February 1 through August 31), exclusion areas shall extend 250 feet around occupied burrows (or farther if warranted to avoid nest abandonment).
- If work or exclusion areas conflict with owl burrows, passive relocation of onsite owls could be implemented as an alternative, but only during the nonbreeding season and only with CDFG approval. The approach to owl relocation and burrow closure will vary depending on the number of occupied burrows. Passive relocation shall be accomplished by installing one-way doors on the entrances of burrows within 160 feet of the project area. The one-way doors shall be left in place for 48 hours to ensure the owls have left the burrow. The burrows shall then be excavated with a qualified biologist present. Construction shall not proceed until the project area is deemed free of owls.
- Unoccupied burrows within the immediate construction area shall be excavated using hand tools, and then filled to prevent reoccupation. If any burrowing owls are discovered during the excavation, the excavation shall cease and the owl shall be allowed to escape. Excavation could be completed when the biological monitor confirms the burrow is empty.
- Artificial nesting burrows will be provided as a temporary measure when natural burrows are lacking. To compensate for lost nest burrows, artificial burrows shall be provided outside the 160-foot buffer zone (CDFG, 1995). The alternate burrows shall be monitored daily for 7 days to confirm that the owls have moved in and acclimated to the new burrow.

Measure 4.6.8b: CCWD shall compensate for permanent habitat losses at a minimum 2:1 ratio (possibly concurrent with other mitigation commitments, such as those for San Joaquin kit fox, provided habitat is present for both species). Compensation could consist of purchasing and enhancing suitable habitat, converting it to a conservation easement, and conveying the easement to a managing agency or institution in perpetuity; participating in a resource agency-approved mitigation bank that provides offset mitigation credits for loss of burrowing owl habitat; or a combination of both. Burrowing owl mitigation areas shall support burrowing owl populations in similar or greater densities to those on impacted burrowing owl habitat.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.9: Project construction and operation activities would result in direct and indirect impacts on existing populations of and habitat for golden eagle, bald eagle, and Swainson's hawk. (Less than Significant with Mitigation; Beneficial for bald eagle foraging habitat)

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Golden eagles are known to nest within the watershed and could be directly and indirectly affected by the project, though nest sites shift regularly. The nearest known golden eagle occurrence to the in-watershed facilities is about 0.5 mile west of the stockpile area. An existing recreational trail, which would be inundated, runs along the western side of the reservoir and comes within 0.1 mile of a golden eagle nest site. A golden eagle nest site is 16 feet from the shoulder of the proposed westside access road (see Figure 4.6-10). Aside from potential construction effects, this road would also be used for recreational purposes (and subject to seasonal closures if golden eagle nesting is identified nearby). Direct impacts on golden eagles would include potential disturbance to nests and the permanent loss of foraging habitat from the westside access road, marina, inundation area and dam footprint. Expansion of the Los Vaqueros Dam and other facilities would cause construction noise and related disturbances that could temporarily reduce available nesting and foraging habitat for golden eagles near the dam and along lower Kellogg Creek (below Los Vaqueros Dam).

Bald eagles may forage within the watershed, but currently do not nest in the watershed. The nearest record of nesting bald eagles is 15 to 20 miles away from the proposed reservoir expansion at Del Valle Reservoir; however, a few bald eagles have recently wintered within the watershed. Expansion of the reservoir could have both beneficial and short-term adverse effects on this species.

Beneficial effects include increased foraging opportunities due to a larger reservoir as well as increased shoreline. This increase could result in more bald eagles using the site for overwintering or initiating nesting in the watershed. Potential adverse impacts would include short-term loss of wintering and foraging habitat during construction, and loss of some roosting trees. The loss of roosting sites would be relatively minimal; however, the increased inundation area would result in the creation of more snags, thus creating new roosting habitat. Reservoir draining and refilling would directly impact habitat availability for bald eagles over a 3- to 4-year term.

Bald eagles do not nest or overwinter in the vicinity of any of the out-of-watershed facilities; therefore, construction of the new Delta Intake and Pump Station or pipelines are not expected to cause direct or indirect impacts to them. As such, the following sections do not include further detailed discussion on bald eagle impacts.

Swainson's hawks are infrequently observed in the Los Vaqueros Watershed. Nesting has not been documented in the watershed, which is at or beyond the western fringe of this species' nesting range. Because Swainson's hawk preferentially forages in Central Valley agricultural lands, the Los Vaqueros Watershed is considered to provide ancillary, and not primary, foraging habitat for this species. The inundation of grasslands habitat under Alternative 1 would cause the loss of this ancillary Swainson's hawk foraging habitat, but such loss is not expected to reduce the availability of resources for this species or affect their distribution. As a result, in-watershed activities are not expected to impact Swainson's hawk populations.

New Delta Intake and Pump Station

Due to a lack of nesting and foraging habitat, golden eagles are not expected to occur near the new Delta Intake and Pump Station.

Swainson's hawks are not known to breed near the new Delta Intake and Pump Station site. Due to ongoing agricultural disturbances and a lack of breeding sites, this species is not expected to forage or breed near the proposed new facilities.

Delta-Transfer Pipeline

Golden eagles are unlikely to occur near the Delta-Transfer Pipeline alignment because of the lack of breeding and foraging habitat along the alignment. The nearest record of breeding golden eagles is in the watershed, about 1.8 miles west of this alignment. No direct or indirect impacts on golden eagle are expected as a result of Delta-Transfer Pipeline construction (see Figure 4.6-10).

Swainson's hawks are known to breed in the pipeline alignment vicinity and could forage and breed within the study area. One nest is documented within 500 feet of the pipeline alignment (see Figure 4.6-9). No other nests are reported within 0.5 mile of the alignment (CDFG, 2008). Permanent upland disturbances associated with the Delta-Transfer Pipeline would be limited to small access vaults (about 100 square feet or 0.002 acre) about every 1,000 feet along the pipeline. Potential temporary impacts would include upland habitat disturbance within the 200-foot-wide construction corridor, and construction disturbance to nests within 0.5 mile of construction. Construction of this pipeline could affect potential Swainson's hawk foraging habitat and active breeding sites if any hawks are present within 500 feet.

Transfer-LV Pipeline

Golden eagles are known to breed near the Transfer-LV Pipeline alignment, which is mostly within the watershed. Three records of breeding golden eagles are within 1 mile of the pipeline alignment; the nearest record is 0.2 mile away. Potential direct impacts on golden eagles include the temporary disturbance of foraging habitat during construction. Indirect impacts would include temporary disturbance to nesting or foraging golden eagles.

Swainson's hawk nests have been recorded within 0.5 mile of the alignment and no active farmlands fall within the alignment. If hawks or their nests are present, temporary impacts could include disturbance of upland habitat within the 200-foot-wide construction corridor and construction disturbances within 0.5 mile of nests. As these project facilities are generally in the

Diablo Range foothills, in an area that is not cultivated, with few Swainson's hawks noted from this area, a low likelihood exists that pipeline construction would affect nesting and foraging habitat.

Transfer-Bethany Pipeline

Golden eagles are not known to breed within the immediate vicinity of the Transfer-Bethany Pipeline alignment, with few available nesting sites in the alignment. The nearest record of breeding golden eagles is 1.7 miles from the proposed alignment. Potential direct impacts on golden eagles associated with the Transfer-Bethany Pipeline would be limited to temporary disturbances to foraging habitat during construction.

Swainson's hawks are not known to breed near this pipeline alignment. No nests have been recorded within 0.5 mile of the alignment, and potential nesting habitat is considered minimal. Temporary impacts would include disturbance of upland habitat and potential disturbance to nests, if present. Because pipeline facilities are generally in the Diablo Range foothills, in an area that is not cultivated, with few Swainson's hawks noted from this area, a low likelihood exists that pipeline construction would affect nesting and foraging habitat.

Expanded Transfer Facility

Golden eagles are not known to breed near the Expanded Transfer Facility site, which supports annual grassland habitat and ruderal[9] habitat. The nearest golden eagle record is 1.6 miles away, within the watershed. Golden eagles in the watershed are unlikely to forage in the tall non-native forbs that dominate the Expanded Transfer Facility site.

Swainson's hawks are not known to nest near the Expanded Transfer Facility site and the fenced site supports tall herbaceous vegetation that is considered poor Swainson's hawk foraging habitat. Nests have not been recorded within 0.5 mile of the facility, and the site and adjacent areas lack nesting sites.

Power Supply Infrastructure (Power Options 1 and 2)

Swainson's hawk nesting habitat does not occur on the Western powerline alignment. Swainson's hawks have not been identified at the PG&E substation or within the powerline alignment, and foraging is not expected in this isolated non-agricultural area.

No impacts are anticipated to golden eagles or bald eagles from these proposed power facilities.

Existing Mitigation Commitments

No existing mitigation commitments for the Swainson's hawk, golden eagle, or bald eagle would be affected by the project. CCWD has monitoring commitments for golden eagles and bald eagles from the EIR/EIS for the Los Vaqueros Reservoir and USFWS BO.

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9 Ruderal habitat refers to disturbed areas that support low quality vegetation assemblages.

Summary for Alternative 1

The construction phase of Alternative 1 would disturb foraging areas for the golden eagle, bald eagle, and Swainson's hawk, and could destroy or disrupt golden eagle and Swainson's hawk nests. Loss of golden eagle foraging habitat in the footprint of the westside access road, reservoir inundation area, Marina Complex, and dam; and small foraging habitat losses to Swainson's hawk along the Delta-Transfer Pipeline from permanent above-ground features would occur. Adverse impacts during operations include potential disturbance of a golden eagle nesting site from use of the new westside access road. The impact to nesting golden eagles and Swainson's hawks is significant and would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.9a. During project operations, bald eagle foraging could benefit from the increased inundation area of the expanded Los Vaqueros Reservoir; however, foraging impacts to golden eagle and Swainson's hawk would be significant prior to mitigation. CALFED and CDFG compensation guidelines would apply to offset impacts to golden eagle and Swainson's hawk foraging habitat, as described in Mitigation Measure 4.6.9b.

Alternative 2

Potential impacts to populations of golden eagle, bald eagle, and Swainson's hawk, and their habitat under Alternative 2 would be the same as those discussed for Alternative 1. Alternative 2 would have significant direct and indirect impacts on golden eagle and Swainson's hawk before mitigation. With implementation of Mitigation Measures 4.6.9a (for each species) and 4.6.9b (for golden eagle and Swainson's hawk), impacts on these raptor species would be reduced to a less-than-significant level.

Alternative 3

Potential impacts to populations of golden eagle, bald eagle, and Swainson's hawk and their habitat due to project implementation under Alternative 3 would be comparable to those discussed for Alternative 1. In the absence of the Transfer-Bethany Pipeline, this alternative would temporarily impact at least 150.9 fewer acres of grasslands habitat that could provide nesting and foraging opportunities for golden eagles and potentially Swainson's hawks.

Expansion of the Old River Intake and Pump Station would not require site modification or physical earthworks within the existing facility site. Expansion of this facility would not affect nesting sites for the above species. No impacts to golden eagle, bald eagle, or Swainson's hawk nests or foraging habitat are anticipated as a result of these activities.

Direct and indirect impacts to golden eagle, bald eagle and Swainson's hawk under Alternative 3 are considered significant prior to mitigation. The implementation of Mitigation Measures 4.6.9a (for each species) and 4.6.9b (for golden eagle and Swainson's hawk) would reduce impacts on these raptor species to a less-than-significant level.

Alternative 4

Golden eagles are known to nest throughout the watershed, and the potential exists that they would be directly and/or indirectly impacted by project activities. Direct impacts include the loss of active or potential nest sites due to construction activities or reservoir inundation, and indirect effects may occur due to construction noise and equipment causing nest abandonment and mortality of young. The westside access road would not be realigned under this alternative; thus, direct impacts would largely be confined to the marina and dam footprint areas, and the 160-TAF borrow area. None of these areas have shown recent golden eagle nesting activity. Because of this, and the absence of the Transfer-LV Pipeline and Transfer-Bethany Pipeline facilities, project activities would be less likely to encounter nesting golden eagles compared with Alternative 1.

Bald eagles do not nest in the watershed. Potential impacts to bald eagles include short-term construction disturbance and loss of some roosting trees. In contrast to Alternative 1, bald eagle foraging habitat and roosting habitat would be available in the Los Vaqueros Watershed during construction under Alternative 4. Though the reservoir would have less water, the suitability of the watershed for bald eagles would not be substantially altered during the 3- to 4-year term of dam construction. The increased reservoir size could result in more bald eagles using the area for overwintering or initiating nesting in the watershed. Potential impacts include the potential loss of some roosting trees when the reservoir is filled, though this will be offset by the creation of new snags.

As described for Alternative 1, in-watershed activities are not expected to impact Swainson's hawk populations or the availability of foraging habitat.

Direct and indirect effects of Alternative 4 are considered significant prior to mitigation. Impacts under this alternative would be limited to the golden eagle, and would be reduced to a less-than-significant level with the implementation of Mitigation Measure 4.6.9a.

Mitigation Measures

Implementation of Mitigation Measures 4.6.9a (for all three species) and 4.6.9b (for golden eagle and Swainson's hawk) would reduce potential impacts associated with project construction to a less-than-significant level.

> **Measure 4.6.9a:** CCWD shall ensure that nesting golden eagles, bald eagles, and Swainson's hawks are protected. The following measures address potential impacts on nesting golden eagles and Swainson's hawks in the project vicinity. Measures that pertain to golden eagles and their nests would apply to nesting bald eagles, were they found in the Los Vaqueros Watershed prior to construction.
>
> - Whenever feasible, construction near recently active nest sites shall start outside the active nesting season. The nesting period for golden eagles is between March 1 and August 15. Bald eagles and Swainson's hawks nest between March 15 and August 15.
>
> - If groundbreaking activities begin during the nesting period, a qualified biologist shall perform a preconstruction survey 14 to 30 days before the start of each new

construction phase to search for golden eagle and Swainson's hawk nest sites within 0.5 mile of proposed activities. If active nests are not identified, no further action is required and construction may proceed. If active nests are identified, the avoidance guidelines identified below shall be implemented.

- For golden eagles, construction contractors shall observe CDFG avoidance guidelines, which stipulate a minimum 500-foot buffer zone around active golden eagle nests. Buffer zones shall remain until young have fledged. For activities conducted with agency approval within this buffer zone, a qualified biologist shall monitor construction activities and the eagle nest(s) to monitor eagle reactions to activities. If activities are deemed to have a negative effect on nesting eagles, the biologist shall immediately inform the construction manager that work should be halted, and CDFG will be consulted. The resource agencies do not issue take authorization for this species.

- If construction begins during the Swainson's hawk nesting period, a qualified biologist shall conduct preconstruction surveys at least 2 weeks prior to construction following CDFG guidance (e.g., CDFG, 2000) in areas that potentially provide nesting opportunities to verify species presence or absence. If the survey indicates presence of nesting Swainson's hawks within a 0.5-mile radius, the results shall be coordinated with CDFG to develop and implement suitable avoidance measures that include construction buffers and nest monitoring.

- Consistent with the *Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California* (CDFG, 1994), mitigation shall include the following approach:

  – No intensive new disturbances or other project-related activities that could cause nest abandonment or forced fledging shall be initiated within 0.25 mile (buffer zone) of an active nest between March 15 and September 15.

  – Nest trees shall not be removed unless no feasible avoidance exists. If a nest tree must be removed, CCWD shall obtain a management authorization (including conditions to offset the loss of the nest tree) from CDFG. The tree removal period specified in the management authorization is generally between October 1 and February 1.

  – Monitoring of the nest by a qualified biologist may be required if the project-related activity has the potential to adversely impact the nest.

- CDFG often allows construction activities that are initiated outside the nesting season to continue without cessation even if raptors such as golden eagles choose to nest within 500 feet of work activities. Thus, work at the dam construction site may continue without delay if surveys verify the local absence of nesting golden eagles, or if groundbreaking begins outside the nesting period (August 16 through February 28).

- After construction, CCWD shall survey for and monitor golden eagle and bald eagle nesting sites in the Los Vaqueros Watershed to ensure that recreational activity and other beneficial uses of the watershed do not disrupt eagle nest sites. Surveys will be performed at the beginning of the nesting season and continue through the nesting season. Consistent with present policy, recreational access and other disruptive activities will be suspended within 500 feet of active eagle nests until the young eagles have fledged.

Measure 4.6.9b: CCWD shall acquire and/or restore foraging habitat for Swainson's hawks and golden eagles in accordance with CALFED and CDFG guidelines, set forth in Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California (CDFG, 1994), as follows:

- Compensate for permanent foraging habitat losses (e.g., agricultural lands and annual grasslands) within 1 mile of active Swainson's hawk nests (acreage to be determined during preconstruction surveys) at a ratio of 1 acre of mitigation lands for each acre of permanent development (i.e., 1:1 replacement ratio). Foraging habitat impacts will be largely limited to valve structures (roughly 10-foot square) every few hundred feet along pipeline routes, with less than an acre of anticipated foraging habitat loss.

- Consistent with MSCS guidance, impacts to golden eagle foraging habitat will be provided by enhancing or restoring foraging habitat at ratio from ratio of 1:1 to 5:1.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.10: Project construction and increased reservoir water levels would result in temporary and permanent loss of potential and occupied habitat for the Alameda whipsnake. (Less than Significant with Mitigation)

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

Upland scrub and nearby associated woodland and grassland habitats in the vicinity of the reservoir expansion area are assumed to support Alameda whipsnakes based on CNDDB records and survey findings (Swaim, pers. comm., 2007).

Scrub Habitat. Direct project impacts on scrub habitat that is suitable for the Alameda whipsnake includes 6.9 acres of permanent impacts and about 0.5 acres of temporary impacts. Areas that would be affected include the borrow area (3.8 acres), marina road (0.6 acre), dam (1.9 acre), and reservoir inundation footprint (0.6 acre). Assuming that some affected areas could be revegetated, scrub habitat would be temporarily affected at the marina road (0.3 acre), inundation footprint (0.2 acre), and westside access road (0.01 acre).

Though scrub habitat at the borrow site is generally isolated from larger scrub habitat blocks, the borrow area provides sufficient cover and vegetation complexity to support the Alameda whipsnake (Swaim, pers. comm., 2007). Also, this area is within the movement capabilities of the Alameda whipsnake relative to other occupied scrub habitat. Construction and use of construction-related vehicles could also cause Alameda whipsnake injury or mortality in scrub and nonscrub habitat, which would be a direct impact.

Nonscrub Habitat. In addition to direct effects caused by the loss of scrub habitat, direct habitat and species effects are expected in adjacent grasslands and oak woodlands. Generally, nonscrub habitat next to more typical "core" scrub habitat provides several important benefits and values for Alameda whipsnakes. Annual grasslands and oak woodlands within several miles of scrub habitat may be routinely used by Alameda whipsnakes during normal foraging and dispersal activities (Swaim, pers. comm., 2007).

Alameda whipsnake movement observations demonstrate that individual dispersing snakes may venture into areas substantially greater than 1,000 feet from scrub habitat, out to 4 miles in some instances (Swaim, pers. comm., 2007). However, the MSCS compensation guidelines do not require compensation for permanent and temporary impacts to nonscrub habitat that may support Alameda whipsnake (CALFED, 2000). Because mitigation is not required for Alameda whipsnake nonscrub habitat under MSCS guidelines, the following analysis of 1,000- and 2,500-foot study buffers around scrub habitat is intended for informational purposes to identify the magnitude of the potential impact to potentially occupied nonscrub habitat, and is not intended to inform Alameda whipsnake mitigation requirements (see **Figure 4.6-26**).[10] **Table 4.6-16** presents the direct impacts on nonscrub upland habitat within 1,000 and 2,500 feet of identified scrub habitat.

TABLE 4.6-16
DIRECT IMPACTS ON NONSCRUB HABITAT WITHIN 1,000/2,500 FEET OF ALAMEDA WHIPSNAKE "CORE" UPLAND SCRUB HABITAT

Habitat Type[1]	Alternatives 1, 2, and 3 Within 1,000/2,500 feet of Upland Scrub	Alternative 4 Within 1,000/2,500 feet of Upland Scrub
Annual grasslands	102.2 acres/404.4 Acres	23.6 acres/141.8 Acres
Oak woodlands	33.8 acres/36.8 Acres	2.0 acres/8.4 Acres
Riparian woodland	5.93 acres/16.2 Acres	3.2 acres/8.8 Acres
Total Impacts to Nonscrub Habitat	141.9 acres/457.4 Acres	28.8 acres/159.0 Acres

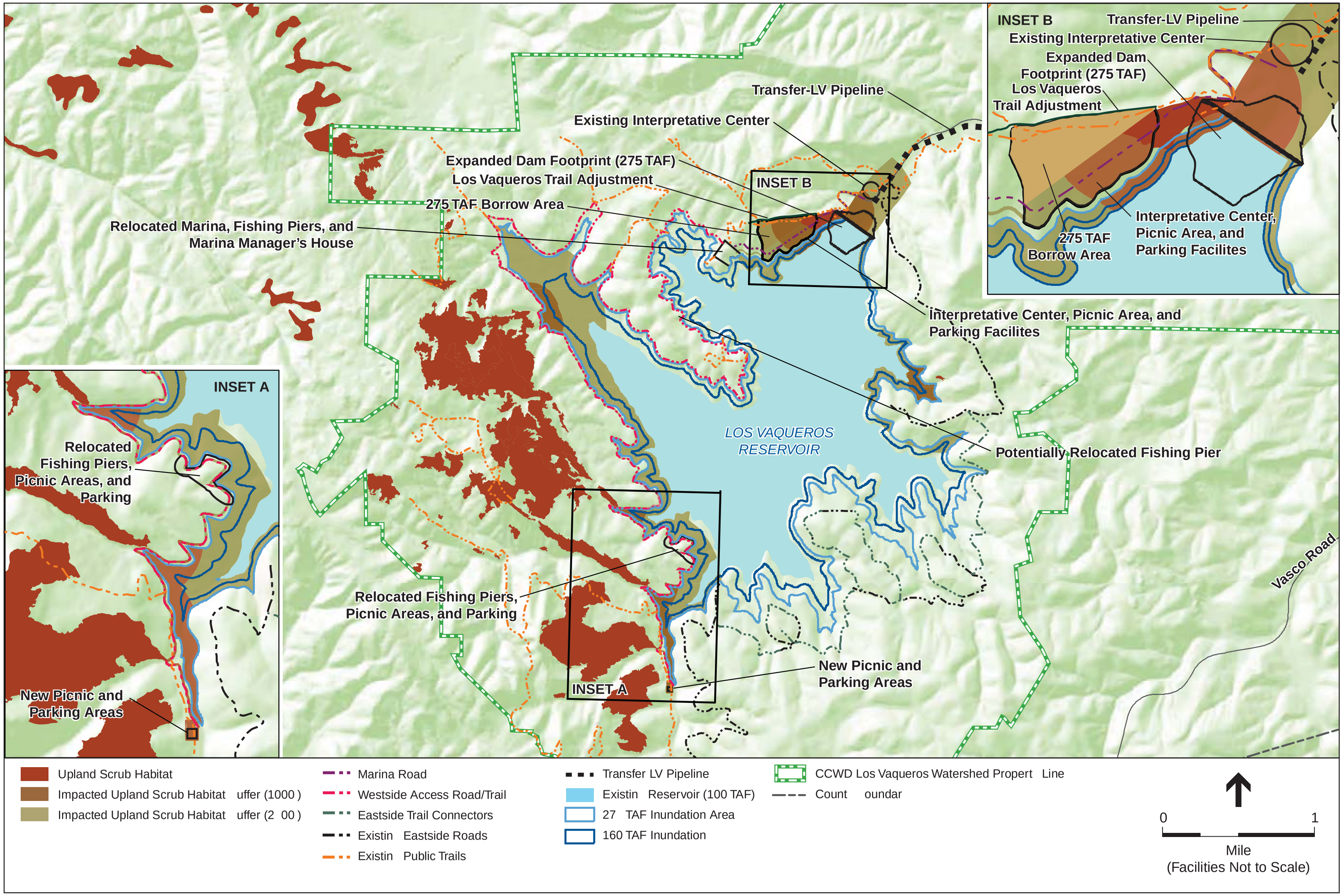
1 Does not include aquatic and emergent habitats, which presumably are not used by Alameda whipsnakes.

SOURCE: ESA unpublished data, 2006-2008

Indirect impacts from grading and other construction activities in scrub and nonscrub habitat could include whipsnake harassment due to noise or vibration.

Reservoir inundation and, in particular, the flooding of annual grasslands near Los Vaqueros Road on the southwestern edge of the reservoir, could indirectly affect the availability of nonscrub habitat for Alameda whipsnakes. Inundation would extend the waterline about 0.5 mile farther south along Los Vaqueros Road, thereby severing the connectivity between scrub habitats to the west of the road and annual grassland to the east. The grasslands areas east of Los Vaqueros Road that would be affected are more than 500 to 1,000 feet from scrub habitat. It is not known if Alameda whipsnakes regularly use annual grasslands habitats east of Los Vaqueros Road; however, such use is expected at least on an intermittent basis.

10 Note that the project does mitigate for grassland and woodlands that may support Alameda whipsnakes.



SOURCE: USGS, 1993 (base map); ECCHCP/NCCP, 2006; and ESA, 2007

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Figure 4.6-26
Potential Impacts to Alameda Whipsna e Habitat

All Other Facilities (Outside the Watershed)

Alameda whipsnake habitat is not present within the study area of any other proposed facility on lands outside the watershed (i.e., new Delta Intake and Pump Station, Transfer Facility Expansion, Delta-Transfer Pipeline, Transfer-LV Pipeline [outside of the watershed], Transfer-Bethany Pipeline, and electrical transmission facilities). Therefore, no impacts would occur as a result of construction or operation of these facilities.

Existing Mitigation Commitments

CCWD has no mitigation commitments for Alameda whipsnakes.

Summary for Alternative 1

Under Alternative 1, the project would directly impact potential and occupied habitat for Alameda whipsnakes through the loss of scrub habitat at the borrow area, marina road, dam, and reservoir footprint; as well as habitat in adjacent oak and riparian woodlands and annual grasslands. Under this alternative, 6.9 acres of scrub would be impacted and 102.2 acres of grasslands would be affected within 1,000 feet of scrub habitat. Impacts related to Alternative 1 would be significant prior to mitigation. Alternative 1-related impacts would be reduced to a less-than-significant level through implementation of Mitigation Measure 4.6.10a, which provides for project-area Alameda whipsnake studies, protection measures during construction, an appropriate revegetation plan, and compensatory habitat creation/restoration within the project area; and Mitigation Measure 4.6.10b, which provides for compensation of permanent habitat losses through the acquisition, protection, and management of occupied scrub habitat.

Alternative 2

Potential impacts to populations of Alameda whipsnakes and their habitat due to project implementation under Alternative 2 would be the same as those discussed for Alternative 1. Impacts would be significant before mitigation. The implementation of Mitigation Measure 4.6.10a and 4.6.10b would reduce this impact to a less-than-significant level.

Alternative 3

Potential impacts to populations of Alameda whipsnakes and their habitat due to project implementation under Alternative 3 would be the same as those discussed for Alternative 1. Because all impacts to Alameda whipsnakes would occur in association with the dam raise, reservoir inundation, and Recreation Facilities (as detailed in Alternative 1), Alternative 3 would be identical to those discussed previously. Project impacts are considered significant prior to mitigation. The implementation of Mitigation Measure 4.6.10a and 4.6.10b would reduce this impact to a less-than-significant level.

Alternative 4

Under Alternative 4, permanent direct impacts on Alameda whipsnake upland scrub habitat are estimated at 6.4 acres (versus 6.9 acres under Alternative 1) and temporary impacts would be about 0.4 acre (0.5 acre was identified for Alternative 1). Permanent impacts include habitat loss at the borrow area (3.8 acres), marina road (0.6 acre), dam (1.9 acre), and the 160-TAF inundation footprint (0.1 acre). Temporary impacts would arise from the marina road (0.3 acre) and westside access road (0.01 acre).

Impacts to nonscrub habitat that may be used by Alameda whipsnakes would be substantially less under Alternative 4 than under Alternative 1 (Figure 4.6-26; Table 4.6-16). Within 1,000 feet of scrub habitat, Alternative 4 would impact 23.6 acres of annual grasslands (versus 102.2 acres under Alternative 1), 2.0 acres of oak woodlands (versus 33.8 acres), and 3.2 acres of riparian habitat (versus 5.9 acres). Within 2,500 feet of scrub habitat, Alternative 4 would impact 141.8 acres of annual grasslands (versus 404.4 acres under Alternative 1), 8.4 acres of oak woodlands (versus 36.8 acres), and 8.8 acres of riparian woodland (versus 16.2 acres). Under Alternative 4, direct impacts to non-scrub habitat that may be used by Alameda whipsnakes are less than half of those anticipated under Alternative 1.

These impacts are considered significant before mitigation. The implementation of Mitigation Measure 4.6.10a, which provides a mitigation and monitoring strategy to avoid and minimize Alameda whipsnake impacts before and during construction, and provide habitat restoration after construction, and Mitigation Measure 4.6.10b, to compensate for habitat losses consistent with MSCS guidelines, would reduce impacts on this species to a less-than-significant level.

Mitigation Measures

Measure 4.6.10a: CCWD shall minimize and/or avoid construction-related impacts on Alameda whipsnakes through the development and implementation of an Alameda whipsnake protection and monitoring plan. USFWS shall approve this plan during formal consultation under FESA Section 7, and shall establish a program of preconstruction surveys and construction supervision to identify and prevent potential hazards to individual Alameda whipsnakes that could be present during construction. The plan shall prohibit or restrict activities that could harm or harass this species. Habitat restoration and compensation shall also be included in the plan. Measures in this plan shall include, but are not limited to, the following:

- A description of the species habitat requirements and movement patterns applicable to the project area.
- A procedure for conducting preconstruction surveys and/or trapping surveys before the onset of initial ground-disturbing activities in areas with high quality habitat, as well as monitoring to be conducted before construction and/or restoration begin each day that these activities shall occur.
- Direct monitoring by a qualified biologist of the clearing of occupied or potentially occupied coastal scrub in the project area that would be directly affected by project construction (not by inundation). Construction shall not proceed until areas have been surveyed to capture and relocate as many Alameda whipsnakes as reasonably possible to minimize take. However, some individuals may be undetected or move in following surveys and would be subject to take.

- A protocol for the selection of USFWS-approved biological monitors who have experience with Alameda whipsnakes to monitor construction activities (such as initial clearing and grading, excavation, and the installation of silt fencing) within and next to Alameda whipsnake habitat.

- Worker education materials and procedures for informing construction crews about the potential presence of Alameda whipsnakes, equipment operation procedures to minimize impacts to whipsnakes, responsibilities of project personnel (such as reporting observations of Alameda whipsnakes within or next to the construction area to the biological monitor), observing speed limits, avoiding use of the haul road until cleared by the biological monitor, and other measures to avoid mortality of whipsnakes during construction; and the role of the monitoring staff in advising construction crews of compliance with take-avoidance measures for Alameda whipsnakes, documenting compliance in monitoring reports, and notifying USFWS within 24 hours of observation of whipsnakes within or next to a construction area.

- Limit stockpiling and staging activities and vehicle and equipment refueling and maintenance to occur in nonsensitive areas.

- CCWD shall prepare and implement a revegetation plan that describes pre-project conditions and available habitats for Alameda whipsnakes, invasive species control measures, and restoration and monitoring success criteria for undeveloped areas disturbed during project construction. The plan will provide the basis for the reestablishment of scrub habitat in disturbed areas and mitigation sites, and will include at a minimum an identification of mitigation areas, site preparation requirements, specifications for planting and/or seeding (e.g., what species and how many plantings), seasonal considerations for planting and site maintenance, the proposed irrigation strategy, performance criteria (e.g., 70 percent survival of plantings 5 years following installation, and 70 percent of plants exhibiting fair or better condition), any contingency measures that may be anticipated, and a provision for semi-annual monitoring and reporting.

Measure 4.6.10b: Consistent with MSCS guidelines, CCWD shall provide compensation for permanent and temporary loss of upland scrub habitat that may support Alameda whipsnakes by either (1) compensating for permanent habitat losses by acquiring, protecting, and managing 2 to 5 acres of existing occupied habitat for every acre within the same area of occupied habitat that would be affected, and/or (2) enhancing or restoring 2 to 5 acres of suitable habitat near the affected areas for every acre of occupied habitat affected (CALFED, 2000).

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.11: Project construction activities could result in direct and indirect impacts on the valley elderberry longhorn beetle and its habitat. (Less than Significant with Mitigation)

The impact assessment for the valley elderberry longhorn beetle relied on elderberry shrub surveys within the watershed (ESA, 2005) and facilities outside the watershed in 2007 and 2008.

Alternative 1

Los Vaqueros Reservoir Expansion, In-watershed Facilities, and Recreational Facilities

In the watershed, the valley elderberry longhorn beetle was documented to occur in several drainages within the proposed inundation area. A total of 85 elderberry shrubs were documented within the watershed during surveys in 2005 (ESA, 2005). USFWS considers that direct or indirect impacts could occur to elderberry shrubs (with stems greater than 1 inch in diameter) within 100 feet of project construction sites (USFWS, 1999c).

The reservoir inundation area supports 45 elderberry shrubs with 249 stems measuring larger than 1 inch in diameter (ESA, 2005). Of these, six shrubs exhibited valley elderberry longhorn beetle exit holes. The inundation of these shrubs could cause direct mortality to beetles and loss of potential and occupied habitat. USFWS guidance indicates that indirect impacts could occur to two elderberry shrubs between 20 and 100 feet from the inundation zone. Indirect impacts could include general habitat degradation and loss of community complexity due to the loss of associated non-elderberry vegetation, general disturbance near occupied habitat, and possibly the accumulation of construction-generated dust on leaves.

The Inlet/Outlet Pipelines study area supports 10 elderberry shrubs with 53 stems greater than 1 inch in diameter (ESA, 2005). Within the project area, no shrubs are within 20 feet of the pipeline footprint, and it is expected that no shrubs would be removed.

Transfer-LV Pipeline

As described for the in-watershed facilities, four elderberry shrubs are within 100 feet of the Transfer-LV Pipeline construction corridor. Of these shrubs, three are more than 75 feet from the near the Inlet/Outlet Pipelines project area. Another elderberry shrub is within 20 feet of the pipeline construction footprint on Kellogg Creek (CDFG, 2008), but not within the pipeline footprint. Therefore, direct impacts (i.e., loss) on valley elderberry longhorn beetles would be limited to one plant, and indirect effects, mainly the potential accumulation of dust on leaves, could occur to three plants.

New Delta Intake and Pump Station, Delta-Transfer Pipeline, Expanded Transfer Facility, Transfer-Bethany Pipeline

Habitat for valley elderberry longhorn beetle is not present in the study areas for the new Delta Intake and Pump Station, Delta-Transfer Pipeline, Expanded Transfer Facility, and Expanded Transfer Facility; therefore, no impacts are expected in these project areas.

Power Supply Infrastructure (Power Options 1 and 2)

Elderberry shrubs do not occur near any of the proposed power facilities under either option; thus, no impacts are anticipated to valley elderberry longhorn beetles.

Summary for Alternative 1

Under Alternative 1, potential impacts to valley elderberry longhorn beetles and their habitat are anticipated for in-watershed work and for the Transfer-LV Pipeline. Reservoir inundation to 275-TAF level would directly impact 45 shrubs, and the dam raise and appurtenant facilities in the Inlet/Outlet Pipelines construction area would affect an additional 10 shrubs. One shrub would be directly affected by the Transfer-LV Pipeline. An additional 41 shrubs may be indirectly impacted by accumulation of dust on leaves. This is considered a potentially significant impact prior to mitigation. The implementation of Mitigation Measure 4.6.11 would reduce impacts to a less-than-significant level.

Alternative 2

Potential impacts to valley elderberry longhorn beetle and their habitat due to project implementation under Alternative 2 would be the same as those discussed for Alternative 1, and would be significant before mitigation. The implementation of Mitigation Measure 4.6.11 would reduce impacts to a less-than-significant level.

Alternative 3

Potential impacts to valley elderberry longhorn beetle and their habitat under Alternative 3 are the same as those for Alternative 1, affecting the same individual elderberry plants by the same mechanisms. These impacts would be significant before mitigation. The implementation of Mitigation Measure 4.6.11 would reduce impacts to a less-than-significant level.

Alternative 4

The 160-TAF inundation zone supports 16 elderberry shrubs, with 74 stems measuring larger than 1 inch in diameter. Of these, two shrubs exhibited valley elderberry longhorn beetle exit holes (ESA, 2005). The inundation of these shrubs could cause direct mortality to beetles and loss of potential and occupied habitat. Elderberry shrubs are not present in the 160-TAF borrow area. Alternative 4 would affect 29 fewer elderberry shrubs than Alternative 1, with similar and indirect dust accumulation effects on vegetation. This would be a lesser, though significant impact prior to mitigation. The implementation of Mitigation Measure 4.6.11 would reduce impacts to a less-than-significant level.

Mitigation Measures

The following measure is based on the Conservation Guidelines for the Valley Elderberry Longhorn Beetle (USFWS, 1999c).

> **Measure 4.6.11:** CCWD shall implement USFWS guidelines (1999 or more current) for avoiding, minimizing, and mitigating project impacts on valley elderberry longhorn beetles. If avoidance is not feasible, USFWS general compensation guidelines call for replacement of elderberry plants in designated mitigation areas at a ratio from 2:1 to 5:1 for each stem greater than 1 inch in diameter. Note that replacement ratios are by stem and not by elderberry shrub. Replacement stock shall be obtained from local sources. Plants are generally replaced at a 2:1 ratio for stems greater than 1 inch in diameter at ground level with no

adult emergence holes, 3:1 for stems where emergence holes are evident in less than 50 percent of the shrubs, and 5:1 for stems greater than 1 inch in diameter with emergence holes.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.12: Project construction activities could affect active breeding bird nest sites and new powerlines could affect migratory birds (Less than Significant with Mitigation)

All Project Alternatives

Loss of Active Nests. Each of the proposed alternatives would cause some degree of temporary habitat disturbance or permanent habitat loss within or near potential nesting habitat for birds that are protected under the federal MBTA. A subset of bird species that nest or could nest in the project vicinity includes the following: Cooper's hawk, sharp-shinned hawk (*A. striatus*), red-tailed hawk, red-shouldered hawk (*B. lineatus*), white-tailed kite, osprey (*Pandion haliaetus*), northern harrier, golden eagle, prairie falcon (*Falco mexicanus*), and other raptors, as well as Bell's sage sparrow (*Amphispiza belli* ssp. *belli*), oak titmouse (*Baeolophus inornatas*), yellow warbler (*Dendroica petechia*), Pacific-slope flycatcher (*Empidonax difficilis*), California horned lark (*Eremophila alpestris actia*), yellow-breasted chat (*Icteria virens*), loggerhead shrike, Allen's hummingbird (*Selasphorus sasin*), Bewick's wren (*Thryomanes bewickii*), California thrasher, and tricolored blackbird. These and other more common bird species may forage and nest in riparian, woodland, scrub, and/or grassland habitats throughout the project area. Nesting sites for shorebird and waterfowl species are similarly protected.

Construction activities associated with the project alternatives (including grading and removal of trees, shrubs, and other potential nesting habitat during the breeding season) could result in direct mortality of nesting birds. Indirect impacts from construction noise, vibrations, and increased human presence could spook adult birds, causing nest abandonment, death of young, or loss of reproductive potential at active nests near project sites. Such project impacts could occur at all facilities associated with the project alternatives.

Impacts of Lighting on Birds. Project alternatives would incorporate relatively low-height, high-intensity lighting during construction, and low-height, low intensity lighting at onsite buildings and facilities after construction. After construction, project lighting would be consistent with existing lighting at the dam and other facilities, which have not been demonstrated to pose a significant impact to flying birds, including shorebirds, waterfowl, passerines, and raptors that occur locally. Consistent with existing lighting in the watershed, light sources would be shielded and directed downward to reduce the amount of light and ambient glare. As a result, outdoor lighting for the project alternatives is not expected to result in a significant impact to wildlife or pose an increased strike hazard to migratory or other flying birds. After construction, shorebirds, waterfowl, passerines, and raptors are expected to use habitats in the project area to the same degree as before the project.

Impacts of Noise and Vibration Effects on Nesting Birds. Generally, more intensive construction activities can impact breeding birds within a larger sphere of influence. This is particularly true for pile driving, jack-hammering, and blasting activities, which may have a short duration, but can be loud and potentially disruptive to local nesting birds. Noise or vibration impacts on nesting golden eagles and other raptors could occur during blasting or jack-hammering activities in the 275-TAF borrow area and at the dam construction site.

Loss of Habitat. Construction disturbances to native habitats that may support nesting birds along pipeline and power alignments would be temporary with no permanent habitat losses. Project construction and reservoir inundation would result in the permanent removal of grassland, scrub, woodland, and riparian habitats that could support breeding birds. However, this impact area represents a small portion of the available nesting, foraging, and wintering habitat for special-status birds in the regional project vicinity.

Conflicts with Powerlines. Alternatives 1, 2, and 3 include the construction of new powerlines by either PG&E or Western that will connect new or upgraded facilities to existing power supplies. Poles and powerlines also pose a danger to raptors as a result of electrocution and collision hazards, and are a recognized source of raptor mortality. Powerline electrocution is the result of two interacting factors: raptor behavior and pole design. Raptors are opportunistically attracted to powerlines because they provide perch sites for hunting, resting, feeding, for territorial defense, or as nesting structures. Many standard designs of electrical industry hardware place conductors and groundwires close enough together that raptors can touch them simultaneously with their wings or other body parts, causing electrocution. Raptors and other birds may also collide with powerlines, which can be difficult for birds to detect for various reasons such as inclement weather conditions. Western typically uses standard hardware that minimizes the potential for bird electrocutions and collisions.

Summary

Temporary habitat disturbance or permanent habitat loss within or near potential nesting habitat for birds that are protected under the federal MBTA is possible under all project alternatives, with no single alternative markedly different from the others when considering these individual avian species as a collective group. This impact is significant before mitigation.

For all project alternatives, the implementation of Measure 4.6.12a and 4.6.12c will ensure that during the nesting season pre-construction surveys will be conducted and any active nests will be adequately buffered. For Alternatives 1, 2, and 3, Mitigation Measure 4.6.12b will reduce the potential for bird electrocution at new powerlines. Implementation of these mitigation measures would reduce impacts to a less-than-significant level.

Mitigation Measures

> **Measure 4.6.12a:** CCWD shall ensure that active nests of raptors and other special-status nesting birds are not disturbed during construction.

If active construction work (i.e., ground clearing and grading, including removal of trees or shrubs) is scheduled to take place during the nonbreeding season (September 1 through January 31), no mitigation is required. If such construction activities are scheduled during the breeding season (February 1 through August 31), the following measures shall be implemented to avoid impacts on nesting raptors and other protected birds:

- Within 30 days of construction, a qualified wildlife biologist shall conduct preconstruction surveys of all potential nesting habitat within 500 feet of construction sites where access is available.

- If active nests are found during preconstruction surveys, a no-disturbance buffer (acceptable in size to CDFG) shall be created around active raptor nests and nests of other special-status birds during the breeding season, or until it is determined that all young have fledged. Typical buffers include 500 feet for raptors and 250 feet for other nesting birds (e.g., shorebirds, waterfowl, and passerine birds). The size of these buffer zones and types of construction activities restricted in these areas could be further modified during construction in coordination with CDFG and shall be based on existing noise and human disturbance levels in the project area.

- If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation shall be required. Trees and shrubs within the construction footprint determined to be unoccupied by special-status birds, or that are outside the no-disturbance buffer for active nests, could be removed.

- If construction commences during the nonbreeding season and continues into the breeding season, most songbirds that choose to nest next to active construction sites are generally considered to acclimate to construction activities, though nest abandonment may occur in some instances. However, nesting site monitoring shall be conducted by CCWD and no-disturbance buffer zones established in coordination with CDFG around active nests to prevent impacts on nesting birds and their young.

Measure 4.6.12b: CCWD shall follow Avian Protection Plan guidelines for powerlines.

CCWD shall use state-of-the-art guidelines to reduce raptor mortality from interactions with powerlines. The Avian Power Line Interaction Committee (1994) and USFWS recommend the following:

- Provide 60-inch minimum horizontal separation between energized conductors or energized conductors and grounded hardware,

- Insulate hardware or conductors against simultaneous contact if adequate spacing is not possible,

- Use Western-approved poles that minimize impacts to birds, and,

- Increase the visibility of conductors or shield wires to prevent and minimize bird collisions.

Measure 4.6.12c: Measures to reduce noise and vibration impact on nesting raptors near the dam and 275-TAF borrow area.

As identified in Measure 4.6.12a, a qualified biologist will conduct preconstruction surveys and establish suitable avoidance buffers around active bird nests. Construction at the 275-TAF borrow area will begin either outside the active nesting season or after verification that breeding birds are absent within 500 feet of work areas. If it appears that noise or vibration from ongoing blasting or jack-hammering at the dam or 275-TAF borrow area could affect nesting raptors that arrive after the start of construction, specific measures shall be implemented to reduce noise levels.

During blasting or jack-hammering, a noise level of no greater than 85 decibels (measured at the nest) will be used as general guidance for raptor nests that are established after construction. This parameter may be met through a variety of standard noise-reducing procedures for construction equipment, including the use of noise dissipaters and blasting mats. Contract specifications will include requirements for the use of blasting methods, including qualifications for the blasting contractor, the use of noise control methods and threshold noise levels, and other limitations. The specifications will also require the submittal of a blasting plan by the contractor that will cover the proposed noise control techniques, blasting charge size and limits, and hours of blasting.

Impact Significance after Mitigation: Less than Significant.

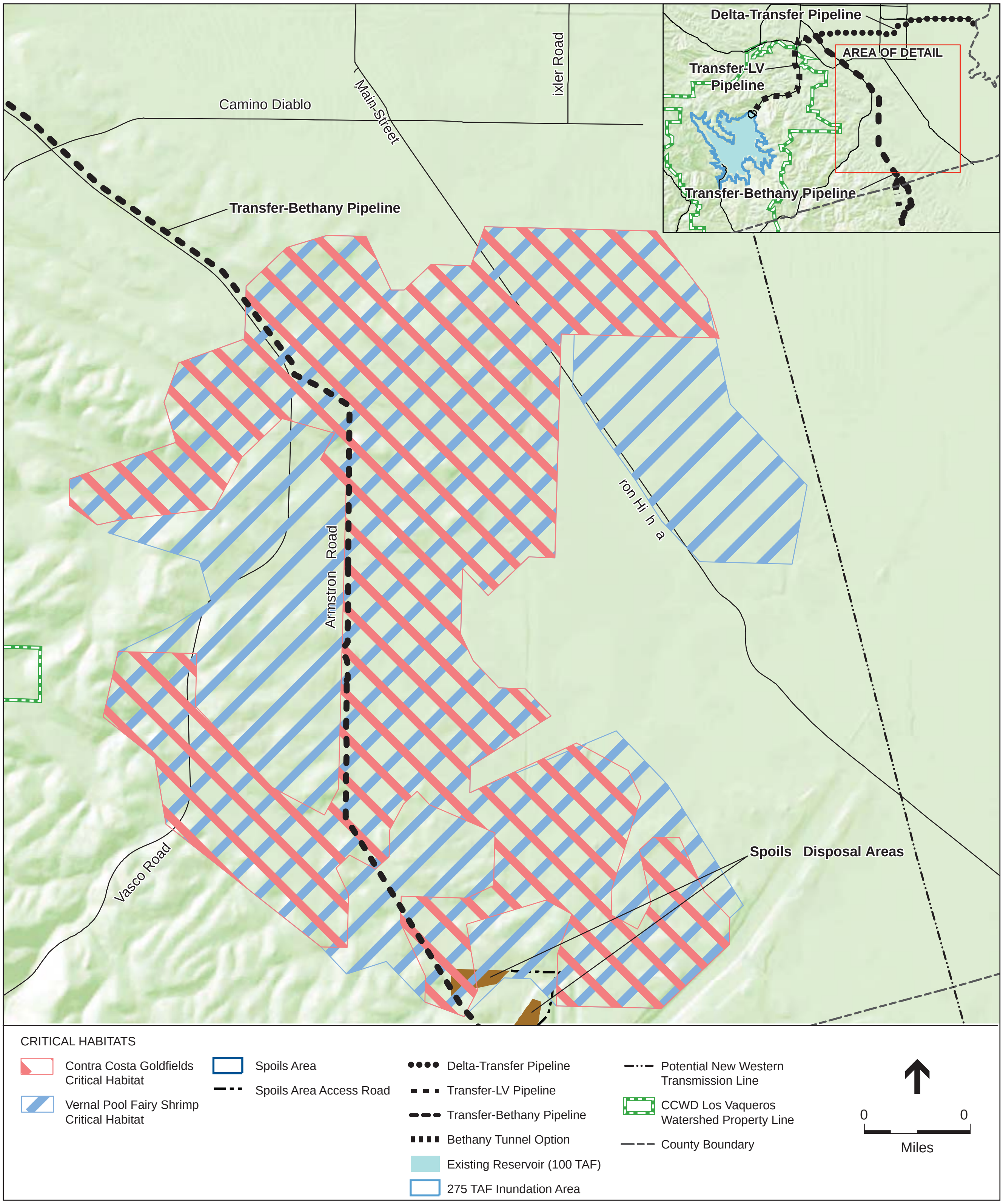
Impact 4.6.13: Project construction activities under Alternatives 1 and 2 could affect designated critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields). (Less than Significant with Mitigation for Alternatives 1 and 2; No Impact for Alternatives 3 and 4)

Alternative 1

The Expanded Los Vaqueros Reservoir, Recreational Facilities, Expanded Transfer Facility, Delta-Transfer Pipeline, Transfer-LV Pipeline, Expanded Old River Intake and Pump Station, and new Delta Intake and Pump Station are not within designated critical habitat; therefore, no impacts would occur from these project components.

Transfer-Bethany Pipeline

As identified in the USFWS Vernal Pool Recovery Plan, a portion of the Transfer-Bethany Pipeline alignment is within the Altamont Hills core area of the Livermore vernal pool region (USFWS, 2005a). The purpose of the plan is to incorporate ecosystem considerations through the development and implementation of recovery measures for communities or ecosystems where federally listed species occur, in a manner that restores, reconstructs, or rehabilitates the structure, distribution, connectivity, and function upon which those listed species depend (USFWS, 2005a). This portion of the alignment has been designated by USFWS as critical habitat for Contra Costa goldfields and vernal pool fairy shrimp (USFWS, 2003; 2006) (see **Figure 4.6-27**).



SOURCE: USGS, 1993 (base map); ESRI, 2006; CCWD, 2007; CCC, 2007; MWH, 2007; and ESA, 2007

Figure 4.6-27
Critical Habitat for Contra Costa Goldfields and Vernal Pool Fair Shrimp

Construction of the Transfer-Bethany Pipeline would directly affect designated critical habitat for Contra Costa goldfields and vernal pool fairy shrimp. About 4.0 miles (145.4 acres[11]) of the proposed pipeline alignment passes through designated critical habitat for vernal pool fairy shrimp and 2.7 miles (98.1 acres) of the alignment passes through designated critical habitat for Contra Costa goldfields.

Contra Costa goldfields are not present in this pipeline project area and are not historically described from the Byron Hot Springs critical habitat unit (USFWS, 2005a; CDFG, 2008). Focused presence/absence surveys failed to identify Contra Costa goldfields in the study area.

Focused surveys in winter 2008 identified 16 vernal pools within or next to the Transfer-Bethany Pipeline alignment that could support vernal pool fairy shrimp. This species was identified from four of these pools, and non-listed fairy shrimp species (versatile fairy shrimp [*Branchinecta lindahli*] and alkali fairy shrimp [*B. Mackini*]) were collected from six others (ESA, 2008b). Vernal pool fairy shrimp are presumed present in all 16 pools based on the presence of suitable habitat.

The critical habitat designation for vernal pool fairy shrimp and Contra Costa goldfields was finalized in 2003 and revised in 2006. The PCEs for these species identified in the Regulatory Setting section of this chapter (i.e., the physical and biological functions that are considered essential to species conservation and require special management considerations or protection) include habitat in the form of vernal pools, swales, or other wetlands features, and the geographic, topographic, and edaphic features that comprise pool complexes. Such conditions are present in portions of the Transfer-Bethany Pipeline alignment. Any proposed activities within designated critical habitat that would alter the physical makeup of pools or reduce the functionality of the larger vernal pool complex would constitute a significant project effect.

Potential indirect effects to vernal pool hydrology in the local vicinity of the Transfer-Bethany Pipeline alignment in Altamont Hills core area of the Livermore vernal pool region are discussed above in Measure 4.6.6.

Summary

Specific impacts within designated critical habitat for vernal pool fairy shrimp and Contra Costa goldfields are characterized in Impact 4.6.6 as the loss of four occupied vernal pool fairy shrimp pools and 12 potentially occupied pools within critical habitat for vernal pool species. Beyond these losses, with the implementation of measures to stockpile claypan materials for use in later reestablishment of surface compaction and contours, the project is not expected to adversely modify designated critical habitat for vernal pool fairy shrimp and Contra Costa goldfields. Impacts related to Alternative 1 are significant prior to mitigation but can be mitigated to a less-than-significant level through the implementation of Mitigation Measures 4.6.2a and 4.6.2b (wetland protection and compensation measures), and Mitigation Measures 4.6.6a and 4.6.6b (vernal pool fairy shrimp protection and habitat compensation measures).

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[11] Acreage assumes a 300-foot-wide construction corridor, which can be constricted within sensitive areas.

Alternative 2

Potential impacts to designated critical habitat under Alternative 2 would be the same as those discussed for Alternative 1, as they both include the Transfer-Bethany Pipeline. This constitutes a significant impact before mitigation. The impact on designated critical habitat from Transfer-Bethany Pipeline construction would be less than significant after the implementation of Mitigation Measures 4.6.2a and 4.6.2b and Mitigation Measures 4.6.6a and 4.6.6b.

Alternative 3

The proposed alternative would have no impact to designated critical habitat because it does not include the Transfer-Bethany Pipeline. No mitigation is required.

Alternative 4

The proposed alternative would have no impact to designated critical habitat because it does not include the Transfer-Bethany Pipeline. No mitigation is required.

Mitigation: None required. See Measures 4.6.2a, 4.6.2b, 4.6.6a and 4.6.6b.

Impact 4.6.14: Project construction activities could affect nonlisted special-status reptile species (San Joaquin coachwhip and coast horned lizard). (Less than Significant with Mitigation)

Alternative 1

Based on large scale range maps, San Joaquin coachwhips and coast horned lizards (*Phrynosoma coronatum blainvillii*) are expected to occur sporadically throughout the regional project vicinity in open, dry areas with little or no tree cover. Documented occurrences of both are patchy, with one documented occurrence of San Joaquin coachwhip in the footprint of the Los Vaqueros Reservoir Dam. No other occurrences are reported in the Los Vaqueros Watershed or near any other project facilities. Coast horned lizard similarly has few reported local occurrences, but may be encountered in the project area. Both species are relatively uncommon and difficult to detect, even when present. All project alternatives would likely result in direct mortality of these species as well as temporary and permanent loss of their habitat.

Impacts to these species include the potential for their destruction by equipment or entrenchment in open trenches or other project facilities. This constitutes a significant impact before mitigation. The Implementation of Mitigation Measure 4.6.14, which minimizes the project footprint within suitable habitat and provides for preconstruction surveys, would reduce impacts on these species from project construction to a less-than-significant level.

Alternative 2

Potential impacts to populations of San Joaquin coachwhips and coast horned lizards and their habitat under Alternative 2 would be the same as those discussed for Alternative 1. This constitutes a significant impact before mitigation. Implementation of Mitigation Measure 4.6.14 would reduce impacts on these species from project construction to a less-than-significant level.

Alternative 3

Potential impacts to populations of San Joaquin coachwhip and coast horned lizard and their habitat due to project implementation under Alternative 3 would be less than under Alternative 1 because Alternative 3 would not affect suitable annual grasslands on the Transfer-Bethany Pipeline that presumably support these species. In total, Alternative 3 would affect at least 150.9 fewer acres of grasslands habitat that could support the San Joaquin coachwhip and coast horned lizard. Project impacts under Alternative 3 would be considered significant before mitigation. Implementation of Mitigation Measure 4.6.14 would reduce impacts on these species from project construction to a less-than-significant level.

Alternative 4

Potential impacts to San Joaquin coachwhips and coast horned lizards would be considerably smaller under Alternative 4 compared with Alternative 1, because impacts would be limited to areas within the Los Vaqueros Watershed. This alternative would affect less habitat for these species within the watershed: 498.5 acres of annual grasslands within the watershed (versus 976.2 acres under Alternative 1) and would not incur the temporary impacts totaling 252.6 acres from the Delta-Transfer Pipeline (24.0 acres), Transfer-LV Pipeline (76.5 acres), Transfer-Bethany Pipeline (150.9 acres), and Expanded Transfer Facility (1.2 acres).

Even so, impacts to San Joaquin coachwhip and coast horned lizard would be significant prior to mitigation. Implementation of Mitigation Measure 4.6.14, which provides for preconstruction surveys and ongoing relocation of identified animals out of construction areas, would reduce impacts on these species to a less-than-significant level.

Mitigation Measures

Measure 4.6.14: CCWD shall ensure that habitat disturbances are minimized in areas that are known or suspected to support San Joaquin coachwhip and coast horned lizard. Within 30 days before surface-disturbing activities, concurrent with other preconstruction wildlife surveys, a qualified biologist shall survey for special-status reptile populations. If individuals of these species are found in the project area, they shall be relocated to suitable habitat 0.5 mile or farther from the project area. Some individuals may be undetected or enter sites after surveys and would be subject to harm.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.15: Project construction activities could affect nonlisted special-status mammal species (American badger, special-status bats, and the San Joaquin pocket mouse). (Less than Significant with Mitigation)

Alternative 1

American badgers are a non-listed species that are found throughout the regional project vicinity and are known to occur in low densities within the watershed (CDFG, 2008). American badgers could be directly affected by vehicle and construction-related mortality at any active construction sites, including those within the watershed and on pipeline routes, at the Expanded Transfer Facility, and near the Delta Intake Facilities. It is not anticipated that this species would be affected by project area noise, dust, or other construction disturbances, with the principal threat being vehicle mortality. The likelihood of encountering this species is considered directly proportional to the scale and duration of construction activities.

Breeding and nonbreeding bats could roost in many of the large sycamore or oak trees that occur in the watershed as well as in trees or structures near pipeline alignments. Crevices in Los Vaqueros Dam could also provide roosting habitat for special-status bats. Focused surveys have not been conducted to document the distribution or types of special-status bats that could be in the study area. Although the loss of individual bats in a nonbreeding roost would not be considered significant, the loss of an active maternity roost, even of relatively common species such as the California myotis (*Myotis californicus*), would be significant. Based on their known range and available habitat in the watershed and along pipeline alignments, bat species that could be affected by the project include the pallid bat, Townsend's big-eared bat, greater western mastiff bat, small-footed myotis bat, long-eared myotis bat, fringed myotis bat, long-legged myotis bat, and Yuma myotis bat.

The San Joaquin pocket mouse is typically found in areas with fine-textured soils. This species was recorded in 2002 near Clifton Court Forebay, about 3.6 miles east of the watershed boundary and 7 miles from the existing Los Vaqueros Dam (CDFG, 2008). Open grasslands and upland scrub communities within the watershed are thought to provide poor quality habitat for the San Joaquin pocket mouse because this species is typically found in areas with friable soils in grasslands and blue oak savannahs (CDFG, 2005). Though not all grasslands habitat is occupied by this species, up to 976.2 acres of permanent impact may occur. Temporary impacts totaling 252.8 acres may occur as follows: other in-watershed facilities (45.8 acres), Delta-Transfer Pipeline (24.2 acres), Transfer-LV Pipeline (76.5 acres), Transfer-Bethany Pipeline (150.9 acres) and Expanded Transfer Facility (1.2 acres). Iodine bush scrub and short grasslands habitat that would generally be avoided within the Power Option 2 Western powerline alignment provide the best available habitat in the project area for this species. This area provides the only local occurrence of this species.

Prior to mitigation, project effects to American badgers, special status bats, and San Joaquin pocket mice would be potentially significant. The implementation of Mitigation Measures 4.6.15a and 4.6.15b would reduce this impact to less-than-significant.

Alternative 2

Potential impacts to nonlisted special-status mammal species due to project implementation under Alternative 2 would be the same as those discussed for Alternative 1. This would constitute a significant impact before mitigation. The implementation of Mitigation Measures 4.6.15a and 4.6.15b would reduce the magnitude of this impact to less-than-significant.

Alternative 3

All facilities proposed under Alternative 3 are discussed under Alternative 1, above. Because a fair likelihood exists that badgers could be encountered on the Transfer-Bethany Pipeline, which would affect about 150.9 acres of annual grassland habitat and is not included in this alternative, the likelihood for incidental badger mortality would be somewhat less under this alternative than for Alternative 1. Project impacts to San Joaquin pocket mice are also expected to be lower in the absence of this pipeline. Impacts to special status bats would be identical under both alternatives.

Prior to mitigation, project effects to American badgers, special status bats, and San Joaquin pocket mice would be potentially significant. The implementation of Mitigation Measures 4.6.15a and 4.6.15b would reduce the magnitude of this impact to less-than-significant.

Alternative 4

Potential impacts to nonlisted special-status mammal species due to project implementation under Alternative 4 would be similar to, but less than those discussed for Alternative 1, with impacts limited to areas within the watershed. As seen for Alternative 3, the absence of pipeline alignments and other project facilities would reduce habitat impacts within grasslands that provide suitable habitat for American badgers and San Joaquin pocket mice, and reduce the likelihood for mortality. Alternative 4 would affect less habitat for these species within the watershed: 498.5 acres of annual grasslands within the watershed (versus 976.2 acres under Alternative 1) and would not incur the temporary impacts totaling 252.8 acres from the Delta-Transfer Pipeline (24.2 acres), Transfer-LV Pipeline (76.5 acres), Transfer-Bethany Pipeline (150.9 acres), and Expanded Transfer Facility (1.2 acres).

Prior to mitigation, project effects to American badgers, special status bats, and San Joaquin pocket mice would be potentially significant. The implementation of Mitigation Measures 4.6.15a and 4.6.15b would reduce the magnitude of this impact to less-than-significant.

Mitigation Measures

Measure 4.6.15a: CCWD shall minimize impacts on badgers through a combination of worker training, preconstruction surveys, and passively or actively relocating animals. Impacts on the San Joaquin pocket mouse and American badger would be reduced by limiting the footprint of direct project effects within the Western powerline alignment.

- A qualified biologist shall conduct a training session for all construction personnel focused on the protection and conservation of protected, nonlisted special-status wildlife species, including American badgers. At a minimum, the training shall include a species and habitat description for the American badger (in addition to other nonlisted special-status species). The training session shall identify the general measures that are being implemented to minimize impacts on these species as they relate to the project, and the boundaries within which the project could be accomplished.

- Concurrent with other required surveys (e.g., as required for Mitigation Measure 4.7), during winter/spring months before new project activities, and concurrent with other preconstruction surveys (e.g., kit fox and burrowing owl), a qualified biologist shall perform a pre-activity survey to identify the presence of American badgers. If this species is not found, no further mitigation shall be required. If badgers are identified, they shall be passively relocated using burrow exclusion (e.g., installing one-way doors on burrows) or similar CDFG-approved exclusion methods. In unique situations it might be necessary to actively relocate badgers (e.g., using live traps) to protect individuals from potentially harmful situations. Such relocation could be performed with advance CDFG coordination and concurrence. When unoccupied dens are encountered outside of work areas but within 100 feet of proposed activities, vacated dens shall be inspected to ensure they are empty and temporarily covered using plywood sheets or similar materials.

- If badger occupancy is determined at a given site within the work area, the construction manager should be informed that work should be halted. Depending on the den type, reasonable and prudent measures to avoid harming badgers will be implemented and may include seasonal limitations on project construction near the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence.

- To minimize the possibility of inadvertent badger mortality, project-related vehicles shall observe a maximum 20 miles per hour speed limit on private roads.

- To prevent accidental entrapment of badgers or other animals during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, or escape routes constructed of earthen materials or wooden planks shall be provided. Before filling, such holes shall be thoroughly inspected for trapped animals.

- All food-related trash items (such as wrappers, cans, bottles, and food scraps) shall be disposed of in closed containers and removed daily from the project area.

- To prevent harassment and mortality of badgers or destruction of their dens, no pets shall be allowed in the project area.

Direct impacts to San Joaquin pocket mice would be minimized in the Western powerline alignment under Power Option 2 by limiting project activities within iodine bush scrub and short grasslands habitat to the smallest possible extent. The implementation of Measure 4.6.7b, which provides habitat compensation for temporary and permanent impacts to annual grasslands that are potentially occupied by San Joaquin kit fox, would additionally benefit American badgers and San Joaquin pocket mice.

Measure 4.6.15b: CCWD shall minimize impacts on special-status bats by performing preconstruction surveys and creating no-disturbance buffers around active bat roosting sites.

Before construction activities (i.e., ground clearing and grading, including trees or shrub removal) within 200 feet of trees that could support special-status bats, a qualified bat biologist shall survey for special-status bats. If no evidence of bats (i.e., direct observation, guano, staining, or strong odors) is observed, no further mitigation shall be required.

If evidence of bats is observed, CCWD and its contractors shall implement the following measures to avoid potential impacts on breeding populations:

- A no-disturbance buffer of 250-feet shall be created around active bat roosts during the breeding season (April 15 through August 15). Bat roosts initiated during construction are presumed to be unaffected by the indirect effects of noise and construction disturbances. However, the direct take of individuals will be prohibited.

- Removal of trees showing evidence of active bat activity shall occur during the period least likely to affect bats, as determined by a qualified bat biologist (generally between February 15 and October 15 for winter hibernacula, and between August 15 and April 15 for maternity roosts). If the exclusion of bats from potential roost sites is necessary to prevent indirect impacts due to construction noise and human activity adjacent, bat exclusion activities (e.g., installation of netting to block roost entrances) shall also be conducted during these periods. If special status bats are identified in the dam or special allowances must be made to relocate bats, CCWD will coordinate the effort in advance with CDFG.

Impact Significance after Mitigation: Less than Significant.

Impact 4.6.16: Draining the reservoir during project construction under Alternatives 1, 2, and 3 could affect Pacific Flyway species, including waterfowl and shorebirds. (Less than Significant)

Alternative 1

Since its completion in 1998, Los Vaqueros Reservoir is used extensively as a stopover for many water-dependent species of waterfowl and shorebirds on the Pacific Flyway. While the reservoir was not created to support migratory birds, the 1,456 acres of open-water and adjacent upland habitats support more than 165 different species of birds. The reservoir provides open-water and freshwater marsh habitats that support an abundance of migratory birds on the Pacific Flyway.

The watershed is noted for its variety of bird life. The Mt. Diablo Audubon Society documented 72,212 birds among 165 different species of birds in their 2006 Christmas bird count (Mueller, pers. comm.). Of these, 53 species are at least partially dependent upon freshwater marsh or open-water habitat provided by the reservoir. Waterfowl species that frequent the reservoir include the Canada goose, wood duck, gadwall, American wigeon, mallard, northern shoveler, northern pintail, green-winged teal, canvasback, redhead, ring-necked duck, greater scaup, lesser scaup, bufflehead, common goldeneye, hooded merganser, common merganser, and ruddy duck. Other birds noted in association with the reservoir include grebes, sandpipers, pelicans, cormorants, egrets, herons, and gulls. Birds use the reservoir throughout the year, although the site is not used as a long-term stopover as are water bodies in Southern California.

The 3-year or longer absence of open-water and freshwater marsh habitat at the reservoir during dam construction would temporarily eliminate bird foraging and stopover habitat on the Pacific Flyway that has been available to migrating waterfowl since 1998. Elimination of open-water areas would temporarily eliminate foraging opportunities and force migrants to use other nearby aquatic locations. This elimination could be viewed as a potentially significant impact of the project because impacts on migratory birds are a potentially significant impact under CEQA and the MBTA.

However, due to the reservoir's relatively recent creation and the relative abundance of other large, permanent water bodies in the regional project vicinity, the temporary loss of the reservoir is not expected to significantly disrupt birds using the Pacific Flyway. During dam construction, water-dependent migratory birds are expected to use other nearby reservoirs and water bodies as foraging and stopover locations. The closest such features are the Delta and Clifton Court Forebay, but foraging and stopover habitat is also available at Lake Del Valle, the Livermore Chain of Lakes, San Antonio Reservoir, San Leandro Reservoir, Suisun Bay, and San Francisco Bay, among other locations.

After the project is implemented, the expanded reservoir would increase open-water habitat and would not reduce upland habitat quality for migratory birds over the long-term. Thus, the temporary loss of foraging and stopover habitat on the Pacific Flyway would be considered a less-than-significant impact, and no mitigation is required.

Alternative 2

Potential impacts to Pacific Flyway bird species due to project implementation under Alternative 2 would be to the same as those discussed for Alternative 1. Impacts under this alternative would be less than significant with no mitigation required.

Alternative 3

Potential impacts to Pacific Flyway bird species due to project implementation under Alternative 3 would be the same as those discussed for Alternative 1. Impacts under this alternative would be less than significant with no mitigation required.

Alternative 4

Because some water would remain in the Los Vaqueros Reservoir during construction, no impacts to Pacific Flyway bird species would occur.

Mitigation: None required.

Impact 4.6.17: The project would not result in conflicts with local and regional conservation plans, or local plans or ordinances protecting biological resources. (No Impact)

All Project Alternatives

The Los Vaqueros Watershed lies within the biological inventory area of the East County HCP/NCCP, but outside of the action area and defined mitigation areas (see **Figure 4.6-28**). The HCP/NCCP designates two land "acquisition analysis zones" in the southeastern corner of the county, east of the Los Vaqueros Watershed. These zones were established to focus the HCP/NCCP conservation strategy into distinct geographic areas without specifically identifying individual parcels. The Zone 5 (Byron Hills) and Zone 6 (East County Cultivated Agriculture) zones (see Figure 4.6-28) are relevant to the current analysis because the Los Vaqueros Reservoir Expansion Project would also target mitigation lands in these areas. The project would also identify conservation areas in Alameda County that are outside of the East County HCP/NCCP acquisition analysis zones.

The Los Vaqueros Watershed is identified in the East County HCP/NCCP as public land for the purposes of protecting water supply, natural resources, and recreation, and is not identified as potential East County HCP/NCCP acquisition land. Therefore, proposed facilities sited within the watershed, and mitigation measures to replace and enhance habitat areas within the watershed, would not conflict with any lands targeted by the HCP/NCCP for acquisition. As quantified in this section, habitat impacts outside the Los Vaqueros Watershed are mostly temporary and associated with project pipelines.

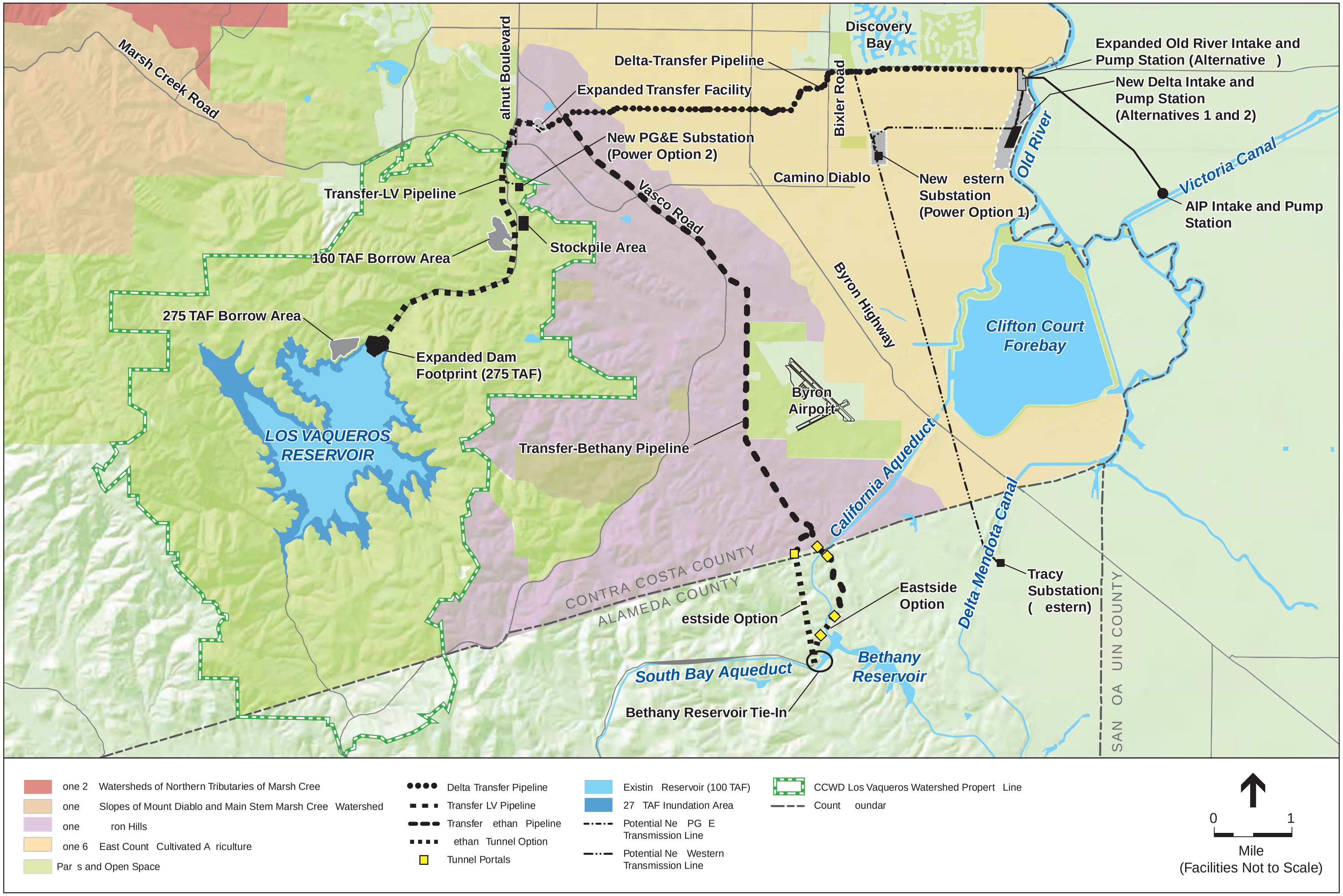
Section 4.6.3 details a comprehensive biological resource mitigation and compensation program that would be implemented for the Los Vaqueros Reservoir Expansion Project and provides for substantial acquisition of mitigation and compensation lands in eastern Contra Costa and Alameda counties. Informal coordination with the East County HCP/NCCP team to date indicates that implementation of the mitigation program for the Los Vaqueros Reservoir Expansion Project could help support the goals and acquisition strategies of the HCP/NCCP without competing for land or conflicting with the conservation goals and objectives of that plan.

Studies completed to date for this project indicate that the region includes ample acreage of suitable habitat to allow implementation of the project mitigation program in concert with the HCP/NCCP. See Section 4.6.3 for further discussion of the framework and guiding principles for the project's biological resource mitigation program.

No local ordinances protecting biological resources apply to the project.

Under all project alternatives, the project would not conflict with the conservation objectives or acquisition goals of the East County HCP/NCCP.

Mitigation: None required.



SOURCE: USGS, 1993 (base map); ECCHCP, 2007; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.6-2
East Contra Costa HCP/NCCP Acquisition Anal sis ones

Impact 4.6.18: Project construction would not make a cumulatively considerable contribution to cumulative effects on special-status species and habitats. (Less than Significant)

Alternative 1

As discussed throughout this section, expansion of the Los Vaqueros Reservoir under Alternative 1 would result in both temporary and permanent effects on biological resources in southeastern Contra Costa County. Most of the project impacts on biological resources would occur within CCWD's Los Vaqueros Watershed. Reservoir expansion would inundate an additional 1,000 acres of habitat, mostly grasslands, and represents the majority of the permanent impact the project would have on biological resources. Other projects in the region would also contribute to the incremental loss of biological resources habitat. As identified in Section 4.1, Approach to the Environmental Analysis, these projects include the Cecchni Ranch development in Discovery Bay, Discovery Bay/Bryon Wastewater Treatment Plant Upgrade, Alternative Intake Project, Zone 7 Altamont Water Treatment plant and Pipeline, DWR South Bay Aqueduct Enlargement Project, and Mountain House Community in northwestern San Joaquin County. Environmental analysis is either underway or completed for most of these projects, and several are presently under construction.

Although the Los Vaqueros Reservoir Expansion Project would result in permanent loss of habitat, mitigation measures have been identified to reduce these effects to less than significant levels. As discussed in Section 4.6.3, CCWD proposes to implement a comprehensive biological resources mitigation program that integrates land acquisition, restoration, enhancement, and long-term preservation and management to compensate for project impacts on biological resources. The existing Los Vaqueros Watershed is an example of CCWD's effective mitigation for the original reservoir project and the District's resource management has provided a net benefit for some habitats and biological resources. The mitigation program for the Los Vaqueros Reservoir Expansion Project would be designed to complement the habitat and species conservation goals and principles established by the East County HCP/NCCP. Implementation of this mitigation program would significantly advance the goals of the East County HCP/NCCP by securing, enhancing, and protecting both a substantial amount of additional biological resources habitat in the region and habitat in strategic locations that can provide valuable linkages among other conservation areas in the region. Given the scope of the mitigation program to be implemented for this project to address effects on biological resources, the effects of the project are considered less than significant after mitigation and the project would not make a cumulatively considerable contribution to potential cumulative effects on biological resources and habitat in the region.

One impact of the project is considered to be significant and unavoidable—the loss of the potential kit fox movement corridor in the grassland area west of the existing reservoir (Impact 4.6.7). This grassland area would be inundated as a result of reservoir expansion. While use of this potential movement corridor has not been documented, because the grassland is suitable habitat for the kit fox, loss of this grassland is considered significant and unavoidable. No other project planned or proposed in the region would also affect this specific potential movement corridor, so no cumulative impact to the corridor would occur.

Elsewhere in the region, other projects within the Diablo Hills and eastern Contra Costa County area that may contribute to the permanent or temporary loss of grassland habitat and effects to San Joaquin kit fox habitat or movement corridors include the Zone 7 Altamont Water Treatment Plant and Pipeline, which would result in the permanent loss of fewer than 40 acres of annual grasslands habitat near the terminus of Dyer Road in Alameda County. This project is not expected to affect kit fox movement corridors and does not appreciably impact habitat for this species. The California Department of Water Resources South Bay Aqueduct Enlargement Project, presently under construction in northern Alameda County, will temporarily affect about 60 acres of annual grasslands habitat in the northern range of the kit fox, and will permanently impact about 25 acres of habitat to accommodate Dyer Reservoir. The SR 4 Highway Widening Project would have only a minor, temporary impact on kit fox habitat and movement.

The Mountain House Community in northwestern San Joaquin County is near the foot of the Diablo Range north of Interstate 205. This phased, 5,000-acre residential and commercial development project, which is identified in the San Joaquin County Multiple Species Habitat Conservation Plan, occupies annual grasslands and former agricultural lands that presumably provided moderate to high habitat values for San Joaquin kit foxes. This project could present a barrier to north-south kit fox movement through agricultural portions of the Valley floor. The environmental reviews conducted for the Mountain House Specific Plan considered direct project effects upon occupied kit fox denning and foraging habitat; however, effects to movement corridors were not identified (County of San Joaquin, 2008). Because the Los Vaqueros Reservoir Project is over 10 miles from the Mountain House Community, and would not affect the same area of potential kit fox movement, the two projects would not result in a significant cumulative impact to kit fox movement corridors.

The implementation of Alternative 1 would not conflict with a land use plan adopted for the purpose of avoiding or mitigating a significant environmental effect, or with an applicable HCP or NCCP.

Alternative 2

Cumulative effects for this alternative would be the same as those described for Alternative 1.

Alternative 3

Cumulative effects for this alternative would be the same as those described for Alternative 1, although fewer facilities would be developed under Alternative 3 compared to Alternative 1.

Alternative 4

Cumulative effects for this alternative would be similar to those described for Alternative 1, although fewer facilities would be developed under Alternative 4 compared to Alternative 1.

Mitigation

Implementation of measures identified throughout this section to address project effects on terrestrial biological resources would also reduce the project's contribution to cumulative effects to a less-than significant level (4.6.1a, 4.6.1b, 4.6.2a, 4.6.2b, 4.6.3a, 4.6.3b, 4.6.4a, 4.6.4b, 4.6.5, 4.6.6a, 4.6.6b, 4.6.7a, 4.6.7b, 4.6.7c, 4.6.8a, 4.6.8b, 4.6.9a, 4.6.9b, 4.6.10a, 4.6.10b, 4.6.11, 4.6.12a, 4.6.12b, 4.6.14, 4.6.15a, and 4.6.15b). These measures would mitigate both direct and indirect impacts of the project alternatives.

Impact Significance after Mitigation: Less than Significant.

4.6.3 Comprehensive Biological Resources Mitigation and Compensation Program

Introduction

This section summarizes the comprehensive biological resource mitigation and compensation program that is being developed in consultation with federal and state resource agencies to satisfy both the mitigation requirements identified in this EIS/EIR and the anticipated permit requirements. The following discussion summarizes project impacts on biological resources (plant communities, wetlands, and special-status species habitats) presented in Section 4.6.2, describes the habitat compensation requirements (acreage) to address these impacts, outlines the principles that will guide project mitigation, and summarizes the findings regarding the availability of suitable land for acquisition to meet the projected requirements for habitat compensation.

Previous and ongoing analyses indicate that suitable lands are available to meet project mitigation needs and show that project objectives are consistent with and complementary to the mitigation goals and strategies put forward under the East County HCP/NCCP approved in July 2007. Like the HCP/NCCP, this program provides a comprehensive framework for species and ecosystem conservation that addresses short- and long-term conservation needs. The proposed mitigation strategy for the project identifies the following:

- Key wildlife and habitat types affected by the project
- Individual species that are members of the plant or wildlife communities that depend on the impacted habitat types
- CALFED habitat compensation guidelines (CALFED, 2000)
- Habitat compensation and conservation opportunities that may be available outside of the watershed

Key factors in identifying suitable mitigation lands include the scarcity of the habitat type, ability to restore or enhance as habitat, and importance to regional conservation due to the strategic location or the particular importance of the lands as habitat for a sensitive status species (e.g., expanding contiguous habitat/corridors or protecting key habitat areas that are subject to isolation or substantial modification). Acquisitions of these types of lands would also comprehensively provide a net long-term benefit to biological resources in the project region beyond the current, pre-project conditions. These goals set by CCWD are also consistent with the MSCS (CALFED, 2000).

Summary of Potential Impacts and Mitigation Requirements

Impacts

Tables 4.6-17, **4.6-18**, and **4.6-19** summarize project impacts to CALFED/NCCP habitat types and associated special-status species that require compensatory mitigation under the various project alternatives.

The general habitat types that would be affected by the project are:

- Grassland habitat, which includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, including nonirrigated and irrigated pasturelands. Under Alternatives 1 and 2, the project would impact 1,505.6 acres of grasslands habitat, which provide habitat for San Joaquin kit foxes, California tiger salamanders, and California red-legged frogs. Portions of the impacted in-watershed acreage also support Alameda whipsnakes. Lesser impacts were identified under Alternative 3 (1,354.7 acres) and Alternative 4 (819.1 acres) (see Tables 4.6-17, 4.6-18, and 4.6-19).

- Valley Oak Woodland and Riparian habitat, which includes all successional stages of woody vegetation commonly dominated by willow, Fremont cottonwood, valley oak, or western sycamore within the active and historical floodplains of low-gradient reaches of streams and rivers; also, non-riparian forest, woodland, and savanna of valleys and foothills commonly dominated by valley oak, blue oak, interior live oak, coast live oak, and foothill pine. Alternatives 1, 2, and 3 would impact 163.3 acres of Valley Oak Woodland and Riparian habitat, all within the watershed, which provides habitat for San Joaquin kit foxes, California tiger salamanders, and California red-legged frogs. Portions of the impacted acreage also support Alameda whipsnakes. Alternative 4 would impact 34.3 acres of Valley Oak Woodland and Riparian habitat (see Tables 4.6-17, 4.6-18, and 4.6-19).

- Upland Scrub habitat, which includes habitat dominated by shrubs characteristic of coastal scrub and chaparral scrub communities. The majority of the scrub habitat within the watershed is chaparral and may include California sagebrush, chamise, wedgeleaf ceanothus, and common manzanita. Under Alternatives 1, 2, and 3, the project would impact 7.0 acres of Upland Scrub habitat, which provides primary habitat for Alameda whipsnakes, and may also support dispersing California tiger salamanders and California red-legged frogs. Impacts under Alternative 4 are 6.7 acres (see Tables 4.6-17, 4.6-18, and 4.6-19).

Seasonal construction constraints presented by terrestrial biological resources (California red-legged frogs and breeding birds, including golden eagles and Swainson's hawks) are summarized in **Table 4.6-20**.

Mitigation Requirements

The amount of habitat to be acquired for mitigation purposes outside of the watershed is guided by measures identified in the MSCS (CALFED, 2000) and input provided during ongoing strategic planning meetings with CDFG and USFWS staff. The mitigation requirements presented in Tables 4.6-17, 4.6-18, and 4.6-19 present both low and high compensation ratios, resulting in a range of potentially required mitigation lands for each habitat type. For example, the MSCS identifies that Upland Scrub habitat shall be replaced at a mitigation ratio between 2:1 (mitigation

TABLE 4.6-17
HABITAT IMPACTS AND MITIGATION SUMMARY, ALTERNATIVES 1 AND 2

	HABITAT IMPACTS (ACRES)						
	Impacted Nonconservation Lands			**Impacted CDFG Kit Fox Conservation Lands**			
HABITAT TYPE[a]	**Temporary**	**Long -Term Temporary**	**Permanent**	**Temporary**	**Long-Term Temporary**	**Permanent**	**Isolated SJKF Grasslands**
Grasslands							
In-Watershed (*supports SJKF, CTS, and CRLF; some AWS*)	15,8	0.0	535.9	11.0	20.0	440.3	214.6
Out-of-Watershed (*supports SJKF, CTS, and CRLF*)	266.8	0.0	1.2	0.0	0.0	0.0	0.0
Subtotal	282.6	0.0	537.1	11.0	20.0	440.3	214.6
Total Grassland Impact: 1,505.6 acres							
Valley Oak Woodland and Riparian							
Supports SJKF, CTS, CRLF, and AWS	28.6	0.0	81.1	3.8	0.0	49.8	NA
Total Valley Oak Woodland and Riparian Impact: 163.3 acres							
Upland Scrub (In-Watershed)							
Primarily AWS habitat, also CTS and CRLF	0.0	0.0	0.0	0.3	0.0	6.7	NA
Total Upland Scrub Impact: 7.0 acres							
MITIGATION AND COMPENSATION SUMMARY [b]							
Annual Grasslands							
Habitat Compensation Ratio Ranges for San Joaquin Fox. Mitigation also compensates for habitat losses for CRLF and CTS Low 1:1 / High 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 3:1
Grasslands Compensation Acreage Required	282.6 to 310.9	0.0	537.1 to 1,611.3	11.0 to 12.1	20.0 to 40.0	440.3 to 1,320.9	214.6 to 643.8
Total Grassland Mitigation Requirement: 1,505.6 to 3,939.0 acres							
Oak Woodlands and Riparian Habitat							
Oak Woodland and Riparian Conservation Required, Low (2:1) to High (3:1)	57.2 to 85.8	0.0	162.2 to 243.3	7.6 to 11.4	0.0	99.6 to 149.4	NA
Total Oak Woodland and Riparian Mitigation Requirement: 326.6 to 489.9 acres							
Upland Scrub							
Upland Scrub Conservation Acreage Required: Low (2:1) to High (5:1)	0.0	0.0	0.0	0.6 to 1.5	0.0	13.4 to 33.5	NA
Total Upland Scrub Mitigation Requirement: 14.0 to 34.8 acres							

a SJKF = San Joaquin kit fox; CTS = California tiger salamander; CRLF = California red-legged frog; AWS = Alameda whipsnake
b Compensation ratios shown are from CALFED MSCS, 2000, Table D.

TABLE 4.6-18
HABITAT IMPACTS AND MITIGATION SUMMARY, ALTERNATIVE 3

	HABITAT IMPACTS (ACRES)						
	Impacted Nonconservation Lands			Impacted CDFG Kit Fox Conservation Lands			
HABITAT TYPE[a]	**Temporary**	**Long -Term Temporary**	**Permanent**	**Temporary**	**Long-Term Temporary**	**Permanent**	**Isolated SJKF Grasslands**
Grasslands							
In-Watershed (*supports SJKF, CTS, and CRLF; some AWS*)	15.8	0.0	535.9	11.0	20.0	440.3	214.6
Out-of-Watershed (*supports SJKF, CTS, and CRLF*)	115.9	0.0	1.2	0.0	0.0	0.0	0.0
Subtotal	131.7	0.0	537.1	11.0	20.0	440.3	214.6
Total Grassland Impact: 1,354.7 acres							
Valley Oak Woodland and Riparian							
Supports SJKF, CTS, CRLF, and AWS	28.6	0.0	81.1	3.8	0.0	49.8	NA
Total Valley Oak Woodland and Riparian Impact: 163.3 acres							
Upland Scrub (In-Watershed)							
Primarily AWS habitat, also CTS and CRLF	0.0	0.0	0.0	0.3	0.0	6.7	NA
Total Upland Scrub Impact: 7.0 acres							
MITIGATION AND COMPENSATION SUMMARY [b]							
Annual Grasslands							
Habitat Compensation Ratio Ranges for SJKF. Mitigation also compensates for upland habitat losses for CRLF and CTS Low 1:1 \ High 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 3:1
Grasslands Compensation Acreage Required	131.7 to 144.9	0	537.1 to 1,611.3	11.0 to 12.1	20.0 to 40.0	440.3 to 1,320.9	214.6 to 643.8
Total Grassland Mitigation Requirement: 1,354.7 to 3,773.0 acres							
Oak Woodlands and Riparian Habitat							
Oak Woodland and Riparian Conservation Required, Low (2:1) to High (3:1)	57.2 to 85.8	0.0	162.2 to 243.3	7.6 to 11.4	0.0	99.6 to 149.4	NA
Total Oak Woodland and Riparian Mitigation Requirement: 326.6 to 489.9 acres							
Upland Scrub							
Upland Scrub Conservation Acreage Required: Low (2:1) to High (5:1)	0.0	0.0	0.0	0.6 to 1.5	0.0	13.4 to 33.5	NA
Total Upland Scrub Mitigation Requirement: 14.0 to 34.8 acres							

a SJKF = San Joaquin kit fox; CTS = California tiger salamander; CRLF = California red-legged frog; AWS = Alameda whipsnake
b Compensation ratios shown are from CALFED MSCS, 2000, Table D.

TABLE 4.6-19
HABITAT IMPACTS AND MITIGATION SUMMARY, ALTERNATIVE 4

	HABITAT IMPACTS (ACRES)						
	Impacted Nonconservation Lands			**Impacted CDFG Kit Fox Conservation Lands**			
HABITAT TYPE[a]	**Temporary**	**Long -Term Temporary**	**Permanent**	**Temporary**	**Long-Term Temporary**	**Permanent**	**Isolated SJKF Grasslands**
Grasslands							
In-Watershed (*supports SJKF, CTS, and CRLF; some AWS*)	19.2	0.0	348.2	0.0	0.0	150.3	301.4
Out-of-Watershed (*supports SJKF, CTS, and CRLF*)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	19.2	0.0	348.2	0.0	0.0	150.3	301.4
Total Grassland Impact : 819.1 acres							
Valley Oak Woodland and Riparian							
Supports SJKF, CTS, CRLF, and AWS	13.6	0.0	0.0	0.0	0.0	20.7	NA
Total Valley Oak Woodland and Riparian Impact: 34.3 acres							
Upland Scrub (In-Watershed)							
Primarily AWS habitat, also CTS and CRLF	0.0	0.0	0.0	0.3	0.0	6.4	NA
Total Upland Scrub Impact: 6.7 acres							
MITIGATION AND COMPENSATION SUMMARY [b]							
Annual Grasslands							
Habitat Compensation Ratio Ranges for SJKF Mitigation also compensates for upland habitat losses for CRLF and CTS. Low 1:1\ High 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 1.1:1	1:1 to 2:1	1:1 to 3:1	1:1 to 3:1
Grasslands Compensation Acreage Required	19.2 to 21.1	0.0	348.2 to 1,044.6	0.0	0.0	150.3 to 450.9	301.4 to 904.2
Total Grassland Mitigation Requirement: 819.1 to 2,420.8 acres							
Oak Woodlands and Riparian Habitat							
Oak Woodland and Riparian Conservation Required, Low (2:1) to High (3:1)	27.2 to 40.8	0.0	0.0	7.6 to 11.4	0.0	41.4 to 62.1	NA
Total Oak Woodland and Riparian Mitigation Requirement: 76.2 to 114.3 acres							
Upland Scrub							
Upland Scrub Conservation Acreage Required: Low (2:1) to High (5:1)	0.0	0.0	0.0	0.3 to 1.5	0.0	12.8 to 32.0	NA
Total Upland Scrub Mitigation Requirement: 13.1 to 33.5 acres							

a SJKF = San Joaquin kit fox; CTS = California tiger salamander; CRLF = California red-legged frog; AWS = Alameda whipsnake
b Compensation ratios shown are from CALFED MSCS, 2000, Table D.

TABLE 4.6-20
SEASONAL CONSTRUCTION CONSTRAINTS FROM TERRESTRIAL BIOLOGICAL RESOURCES

Species	Constraint
California red-legged frog (Impact 4.6.4)	Work within or next to aquatic breeding habitat will be conducted between May 1 and November 1. Activities below Los Vaqueros Dam and in the Inlet/Outlet Pipelines construction area that affected aquatic breeding habitat, including Kellogg Creek, shall be initiated during this period and may thereafter continue year-round.
Breeding birds (Impacts 4.6.8, 4.6.9, and 4.6.12)	<u>For all breeding birds during the breeding season:</u> For work during the breeding season (February 1 though August 31), specific measures would be applied to avoid impacts to nesting raptors and MBTA birds species to include: • Preconstruction surveys • Establishment of buffer zones around active nests as follows - 250 feet for passerine bird nests and 500 feet for raptor nests - 250 feet for active burrowing owl nests - 0.25-mile buffer zone around Swainson's hawk nests between March 15 and September 15 - 500 foot buffer for golden eagles between March 1 and August 15 (or initiate work at specific sites outside the nesting period) <u>For burrowing owls only during the non-breeding season:</u> For work within suitable habitat during the nonbreeding season (September 1 through January 31) the following mitigation is required for burrowing owls: • Preconstruction surveys • Establishment of 160-foot buffer zones around occupied burrows

acreage: impacted acreage) and 5:1. These ratios are considered guidelines; the permitting agencies will determine project requirements on a case-by-case basis depending upon factors such as the quality of the impacted habitat and the ability of replacement habitat to emulate displaced functions and values. **Table 4.6-21** lists the acreages of habitat needed to mitigate impacts under the four project alternatives.

The approach used in this analysis to compensate for anticipated impacts to these habitat types is to acquire and manage large areas of comparable habitat outside of the watershed but within eastern Contra Costa County and Alameda County. However, for habitats such as valley/foothill riparian and wetlands, mitigation efforts would most likely consist primarily of restoration and enhancement of existing habitats within the watershed.

Note that the mitigation for San Joaquin kit fox (grasslands) habitat will likely extend beyond Contra Costa County into northeastern Alameda County because of the special habitat considerations for the species, as well as to provide a greater regional conservation benefit. The prioritization of mitigation lands for acquisition shall consider factors other than just acreage, such as the Recovery Plan for kit foxes, connectivity between habitats (i.e., linkage and movement), current species' range, and other data to maximize benefits to the species. It is likely that land acquisition will concentrate on strategic locations within the region, generally north of Interstate 580, within or next to the Altamont Hills that advance the conservation and recovery objectives of this species. Lands just south of Interstate 580 that provide habitat benefits to maintain north-south habitat continuity are also eligible for consideration.

TABLE 4.6-21
ACREAGE OF HABITATS IDENTIFIED FOR ACQUISITION

	Habitat Affected (Acres)[a]			Conservation Ratios[b]		Acreage of Conservation Habitat Needed for Alts 1 and 2		Acreage of Conservation Habitat Needed for Alt 3		Acreage of Conservation Habitat Needed for Alt 4		Acres[c] of Habitat on Private Lands Identified within Eastern Contra Costa County[d]
	Alts 1and 2	**Alt 3**	**Alt 4**	**Low Ratio**	**High Ratio**	**Low Estimate**	**High Estimate**	**Low Estimate**	**High Estimate**	**Low Estimate**	**High Estimate**	
Grassland	1,505.6	1,354.7	819.1	1:1 temp 1:1 perm	1:1 temp 3:1 perm	1,505.6	3,939.0	1,354.7	3,773.0	819.1	2,420.8	26,994
Valley/Foothill Riparian	2.8 temp/ 0.9 perm	Same as Alt. 1	0	2:1	3:1	7.4	11.1	7.4	11.1	0	0	299
Valley/Foothill Woodland and Forest (BLO = blue oak. VO = valley oak)	BLO: 114.3/ 9.0 at mit. sites VO: 31.6 perm/128.0 a t mit. sites	Same as Alt 1	BLO: 17.6 perm/ 9.0 at mit. sites VO: 31.6 perm/ 128.0 at mit. sites	2:1	3:1	BLO: 246.6 VO: 319.2	BLO: 369.3 VO: 478.8	BLO: 246.6 VO: 319.2	BLO: 369.3 VO: 478.8	BLO: 53.2 VO: 319.2	BLO: 79.8 VO: 478.8	12,304
Upland Scrub	7.0	7.0	6.7	2:1	5:1	14.0	35.0	14.0	35.0	13.1	33.5	431
Total	1,847.0	1,696.1	842.6			2,092.8	4,833.2	1,941.9	4,667.2	3,012.9	3,012.9	40,028

a Calculated from maximum potential impacts.
b Specifies a quantitative mitigation factor identified in the MSCS (CALFED, 2000) Table D.
c Acres on private lands identified in East Contra Cost County HCP/NCCP study area. Includes all riparian habitats, woodlands on parcels with 20 acres or more of habitat, upland scrub with 20 acres or more of habitat, and grasslands with 40 acres or more of habitat.
d Does not include lands identified in northeastern Alameda County that are presently under analysis.

mit. = mitigation
perm = permanent
temp = temporary

The East County HCP/NCCP identified suitable core habitat for kit foxes and potential primary movement routes within the watershed as well as areas surrounding the watershed that connect existing protected lands as part of the species' conservation strategy (East County HCPA, 2006). USFWS has also identified "satellite" populations at the northern extent of the San Joaquin kit fox's range in Contra Costa County that may include Herdlyn Watershed, south of Los Vaqueros Watershed, and Round Valley Regional Preserve, north of Los Vaqueros Watershed (Larsen, pers. comm.). The range of this species in the northern portion of its range is presented in Figure 4.6-11.

The *Recovery Plan for Upland Species of the San Joaquin Valley* has further identified as primary recovery actions the protection of existing habitat for federally and state-listed San Joaquin kit foxes in the northern portion of its range *and* protection of existing San Joaquin kit fox connections between habitat in Contra Costa County and habitat farther south (USFWS, 1998). Therefore, acquiring lands within Alameda County and the HCP/NCCP Planning area would provide additional opportunities to further maintain local and regional kit fox corridors and contribute toward the species' recovery.

Mitigation Lands Opportunities

Private lands for potential acquisition for conservation and enhancement purposes were identified using a combination of existing plans and policies, aerial photography, field surveys, and GIS analyses. Private lands include those properties that are not under the ownership of any municipalities or public agencies. For example, all state and county parks, water district and flood control district lands, schools, and federal lands are considered public lands and are excluded from this designation.

To quantify potentially available lands by habitat type, East County HCP/NCCP electronic data were compared with CALFED NCCP habitat designations for consistency of habitat designations.

The East County HCP/NCCP identified and prioritized potential habitat acquisition areas that would meet the goals of its plan. These habitat areas were mapped as existing within public or private lands using the Contra Costa County parcel database information. Then, using satellite imagery taken from 2005 and 2006, ESA, Inc. updated the HCP information to exclude habitat on private lands that had been developed since the HCPs inception. Then, to determine the acreage of potentially available lands, the private lands data were queried to include parcels containing the following: habitat areas greater than or equal to 20 acres for valley/foothill woodland and forest and upland scrub habitats; and habitat areas greater than or equal to 40 acres for grassland habitat. Due to the relative scarcity and geography of riparian habitat on the landscape, no minimum acreage was set for this habitat type.

To develop a methodology to prioritize potentially available private lands, field reconnaissance surveys were conducted to corroborate qualitative habitat assessments made using aerial imagery. The goal was to develop a key of habitat characteristics that corresponded to suitable habitat (i.e., comparable to or better than those habitats potentially affected by the project) to prioritize potentially available public lands for acquisition. These surveys focused on valley/foothill woodland and forest, and upland scrub habitats. Grassland and riparian habitats were not surveyed because grasslands are considered to be fairly uniform throughout the region and riparian habitats would most likely be restored and/or enhanced within the watershed. Examples employing this methodology are included below.

Grassland

Land acquisition efforts for grasslands would focus on acquiring comparable or higher quality grassland habitat than that impacted by the project. Grassland habitat, which is the most dominant habit in the watershed, includes upland vegetation communities dominated by introduced and native annual and perennial grasses and forbs, such as nonirrigated and irrigated pasturelands. Grassland covers 12,819 acres, or 77 percent of the watershed (ESA, 2004).

Alternatives 1 and 2 would affect 1,505.6 acres of grassland, Alternative 3 would affect 1,354.7 acres, and Alternative 4 would affect 819.1 acres. A breakdown of temporary versus permanent project effects is presented in Tables 4.6-17, 4.6-18, and 4.6-19. The maximum number of acres required for grassland mitigation under Alternatives 1 and 2 is estimated at 3939.0 acres (see Table 4.6-21). The amount of grassland habitat potentially available for acquisition in Contra Costa County is 26,994 acres—more than 6 times the amount of grassland mitigation lands required. Additional suitable lands are available in Alameda County.

Valley/Foothill Riparian

Mitigation efforts for valley/foothill riparian habitat focused on restoration and enhancement of riparian habitat within the watershed. Valley/foothill riparian habitat includes all successional stages of woody vegetation, commonly dominated by willow, Fremont cottonwood, valley oak, or sycamore, within the active and historical floodplains of low-gradient reaches of streams and rivers generally below a 300-foot elevation.

Alternatives 1 through 3 would impact 3.7 acres of valley/foothill riparian habitat (principally cottonwood habitat), and Alternative 4 would impact 0.09 acre of valley/foothill riparian habitat. The maximum number of acres estimated to be required for mitigation of woody riparian habitat would be 11.1 acres.

About 299 acres of valley/foothill riparian habitat have been identified as available for acquisition within eastern Contra Costa County, and 67 acres have been identified as available for restoration and enhancement within the watershed. Mitigation for riparian habitat would primarily involve restoration and enhancement of existing or disturbed habitat within the watershed, and acquisition of riparian habitats as needed to meet potential maximum mitigation requirements.

Valley/Foothill Woodland and Forest

Land acquisition efforts for valley/foothill woodland and forest would focus on acquiring comparable or higher quality oak woodland and oak savanna habitats than those impacted by the project. Oak habitat covers 3,010 acres, or 18 percent of the watershed, and is the second most common habitat type within the watershed (ESA, 2004). Oak woodland has relatively dense stands of oaks and may include more shrubs in the understory, while oak savanna characteristically contains fewer and widely spaced individual oak trees with an open canopy and grassland understory.

Alternatives 1, 2, and 3 would permanently impact 114.3 acres of blue oak woodland and forest and 9.0 acres of blue oak mitigation lands, 31.6 acres of valley oak woodland and forest, and 128.0 acres of valley oak mitigation lands. Alternative 4 would permanently impact 17.6 acres of blue oak woodland and forest plus 9.0 acres of blue oak mitigation lands, 31.6 acres of valley oak woodland and forest, and 128.0 acres of valley oak mitigation lands. The maximum number of acres estimated to be required for mitigation of Valley/Foothill Woodland and Forest would be 369.3 acres of blue oak habitat and 478.8 acres of valley oak habitat.

About 12,304 acres, significantly more than the required amount of valley/foothill woodland and forest habitat, have been identified as potentially available for acquisition within eastern Contra Costa County.

Upland Scrub

Land acquisition efforts for upland scrub habitat (i.e., chaparral), would focus on acquiring comparable or higher quality chaparral habitat than that impacted by the project. Chaparral habitat comprises about 775 acres, or about 4 percent, of the watershed (ESA, 2004). Within the watershed chaparral habitat generally occurs along ridges and upper slopes as homogeneous patches within oak woodland. Outside of the watershed, chaparral habitat occurs in a similar fashion, usually surrounded by or next to stands of oak woodland. Therefore, it is both logical and preferable to acquire areas of chaparral habitat that are also within suitable stands of oak woodland to preserve general habitat continuity.

Alternatives 1 through 3 would impact 7.0 acres of chaparral habitat, while Alternative 4 would impact up to 6.7 acres. The maximum number of acres required for mitigation of chaparral habitat is estimated at 35 acres. The amount of chaparral habitat potentially available for acquisition is 431 acres, more than 10 times the amount required, and does not include available lands in Alameda County.

Mitigation Site Selection and Acquisition Priorities

Mitigation Land Acquisition Strategy

For purposes of maximizing habitat value and wildlife benefits, the highest priority sites for acquisition and management would consist of:

- Large contiguous areas of habitat that are both near and distant from development and urban centers that provide key values for San Joaquin kit foxes, but also for California tiger salamanders, California red-legged frogs, and/or Alameda whipsnakes
- Lands next to or near the watershed or other existing land reserves

Large contiguous areas of land are considered to be ideal because they offer a smaller perimeter-to-area ratio and would be less likely to become fragmented. Areas near urban centers or rapidly growing suburbs may be threatened by encroaching development. Similarly, areas far from developed areas and near or next to existing reserves are less likely to be impacted by development and would provide large continuous areas of undisturbed habitat for wildlife.

Strategically located lands in agricultural development may also be considered higher priority for acquisition, either to ensure lands remain in continued agricultural use, or to abate the long-term habitat modification and degradation threats. While these lands may be smaller in size and closer to existing urban lands, they can be considered to be in greater jeopardy than more remote or distant properties.

The selection of acquisition lands would be an ongoing process performed in coordination with multiple parties, including regulatory agencies, land management agencies, and CCWD to develop an acceptable mitigation strategy and approach. Multiple factors would need to be considered when selecting the potential lands for acquisition. Such factors include the habitat suitability in terms of habitat size, continuity, and value to wildlife, particularly endangered species. In addition, the parcels' proximity to existing preserves and other suitable parcels would be considered.

Mitigation Site Selection Strategy

Habitat Suitability

The use of aerial imagery and professional judgment would be key to identifying suitable mitigation habitat (i.e., comparable or higher quality than lands potentially impacted). The goal is to develop a methodology of desktop review that can be used to further refine lands potentially available for acquisition that would meet the project's mitigation needs, not only on a quantitative basis, but on a qualitative basis as well.

Field reconnaissance of oak woodland and chaparral habitats confirms that habitat type, overall habitat quality, the degree of local development, and potential functional values relative to target species can be assessed from aerial photos. It is important to note, however, that this preliminary screening process is an initial tool to identify potentially suitable mitigation lands, and would be ground-truthed to verify site conditions before reaching a recommendation of site acquisition.

To further refine the habitat value of potential mitigation lands for wildlife species, subject parcels would be compared to the value of impacted habitats within the watershed. Baseline data collected within the watershed include an evaluation of habitats for wildlife value using USFWS' HEP. The HEP is a method of assessing the functional value of a habitat for a representative species for that habitat using specific habitat criteria. Using the HEP would help further prioritize mitigation land acquisition in the next steps.

Conclusions

The mitigation program continues to be refined in consultation with the resource agencies to address project effects on biological resources. Evaluation of land within the eastern county region shows that the acreage of land identified in eastern Contra Costa County for potential acquisition greatly exceeds the compensatory needs of the Los Vaqueros Reservoir Expansion Project. Lands that are presently under analysis in Alameda County further bolster the available pool of mitigation lands.

4.7 Land Use

This section presents an analysis of potential land use impacts that would result from implementation of the Los Vaqueros Reservoir Expansion Project. The section includes a description of existing conditions, the associated regulatory framework (including applicable land use policies), significance criteria, and environmental impact analysis.

4.7.1 Affected Environment

Regulatory Setting

Federal

Federal Aviation Administration

The Federal Aviation Administration (FAA) is the branch of the U.S. Department of Transportation with regulatory responsibility for civil aviation. It is responsible for establishing policies and regulations to ensure the safety of the traveling public. The FAA oversees publicly owned airports that are open to the public and airports that receive federal funding.

FAA Advisory Circular 150/5200-33B addresses hazardous wildlife attractants on or near airports (FAA, 2007). This Advisory Circular is intended to provide guidance on siting certain land uses that have the potential to attract potentially hazardous wildlife to a public-use airport or its vicinity. The FAA Advisory Circular recommends against “land use practices that attract or sustain populations of hazardous wildlife within the vicinity of airports or cause movement of hazardous wildlife onto, into, or across the approach or departure airspace, aircraft movement area, loading ramps, or aircraft parking area of airports.” The Advisory Circular recommends a separation distance of 5,000 feet between potential hazardous wildlife attractants and aircraft movement areas at facilities that support piston-powered aircraft, and a 10,000-foot distance between potential hazardous wildlife attractants and airports that support turbine-powered aircraft. The separation distance recommendation extends to 5 statute miles for approach-departure areas. For projects that are outside the 5,000 or 10,000-foot criteria but within 5 statute miles of the airport’s air operations area, the FAA may review development plans, proposed land-use changes, operational changes, or wetland mitigation plans to determine whether such changes in land use would create potential wildlife hazards to aircraft operations.

FAA is also responsible for enforcing the Federal Aviation Regulation (FAR) Part 77, Objects Affecting Navigable Airspace, which provides guidance for the height of objects that may affect normal aviation operations. Tall structures, construction cranes, trees, or high terrain on or near airports may constitute hazards to aircraft. Through the FAA regulatory review process, implementing agencies or project proponents submit design plans for proposed projects in the vicinity of airports for FAA to evaluate whether the project or its construction has the potential to interfere with normal aviation operations and create safety hazards for air travelers and those on the ground.

State

State Lands Commission

The State Lands Commission has jurisdiction over 4.5 million acres of land held in trust for Californians. The State Lands Commission's jurisdiction includes a 3-mile-wide section of tidal and submerged land next to the coast and offshore islands, including bays, estuaries, and lagoons. It also includes the waters and underlying beds of more than 120 rivers, lakes, streams, and sloughs. The State holds these lands for the public trust purposes of water-related commerce, navigation, fisheries, recreation, and open space. The State Lands Commission may grant dredging permits and issue land use leases for construction and operation of facilities within its jurisdiction. It does not have a comprehensive use plan for these lands but manages them according to state laws and regulations.

Of the areas where facilities could be sited under the proposed project, the commission's jurisdiction includes Old River, at the location of the existing Old River Intake and Pump Station and proposed new Delta Intake and Pump Station. Contra Costa Water District (CCWD) currently has a lease for the existing Old River Intake Facility, and a new lease would be required for a new Delta Intake and Pump Station. In addition, construction and operation of these facilities may require obtaining a General Permit from the State Lands Commission.

Land Use and Resource Management Plan for the Delta

The Delta Protection Act of 1992 established the Delta Protection Commission, a state entity created to plan for and guide the conservation and enhancement of the natural resources of the Delta while also sustaining agriculture and meeting increased recreational demand. The Delta Protection Act defines a Primary Zone, which is the principal jurisdiction of the Delta Protection Commission. The act requires the Delta Protection Commission to prepare and adopt a management plan for the Delta, which must meet specific goals.

In 1995, the Delta Protection Commission adopted the *Land Use and Resource Management Plan for the Delta*. Local general plans within the Primary Zone must be consistent with the management plan, and subsequent project approvals must be consistent with those general plans (Delta Protection Commission, 1995). No existing or proposed Los Vaqueros Reservoir Expansion facilities are within the Primary Zone of the Delta.

The Secondary Zone is the area outside the Primary Zone and within the "Legal Delta"; the Secondary Zone is not within the planning area of the Delta Protection Commission, but the Delta Protection Commission may comment on development projects within the Secondary Zone in the event that a project in the Secondary Zone could affect lands within the Primary Zone. Lands within the Secondary Zone are subject to the land use authority of local government. The Land Use section of the *Land Use and Resource Management Plan for the Delta* includes the following policies and land use recommendations related to development and activities within the Secondary Zone of the Delta:

> *P-8*. Local government policies regarding mitigation of adverse environmental impacts under the California Environmental Quality Act may allow mitigation beyond county boundaries,

if acceptable to reviewing fish and wildlife agencies, for example in approved mitigation banks. Mitigation in the Primary Zone for loss of agricultural lands in the Secondary Zone may be appropriate if the mitigation program supports continued farming in the Primary Zone.

R-5. To the extent possible, any development in the Secondary Zone should include an appropriate buffer zone to prevent impacts of such development on the lands in the Primary Zone. Local governments should consider needs of agriculture in determining such a buffer.

The Utilities and Infrastructure section of the *Land Use and Resource Management Plan for the Delta* includes the following policy related to development and activities within the Secondary Zone of the Delta:

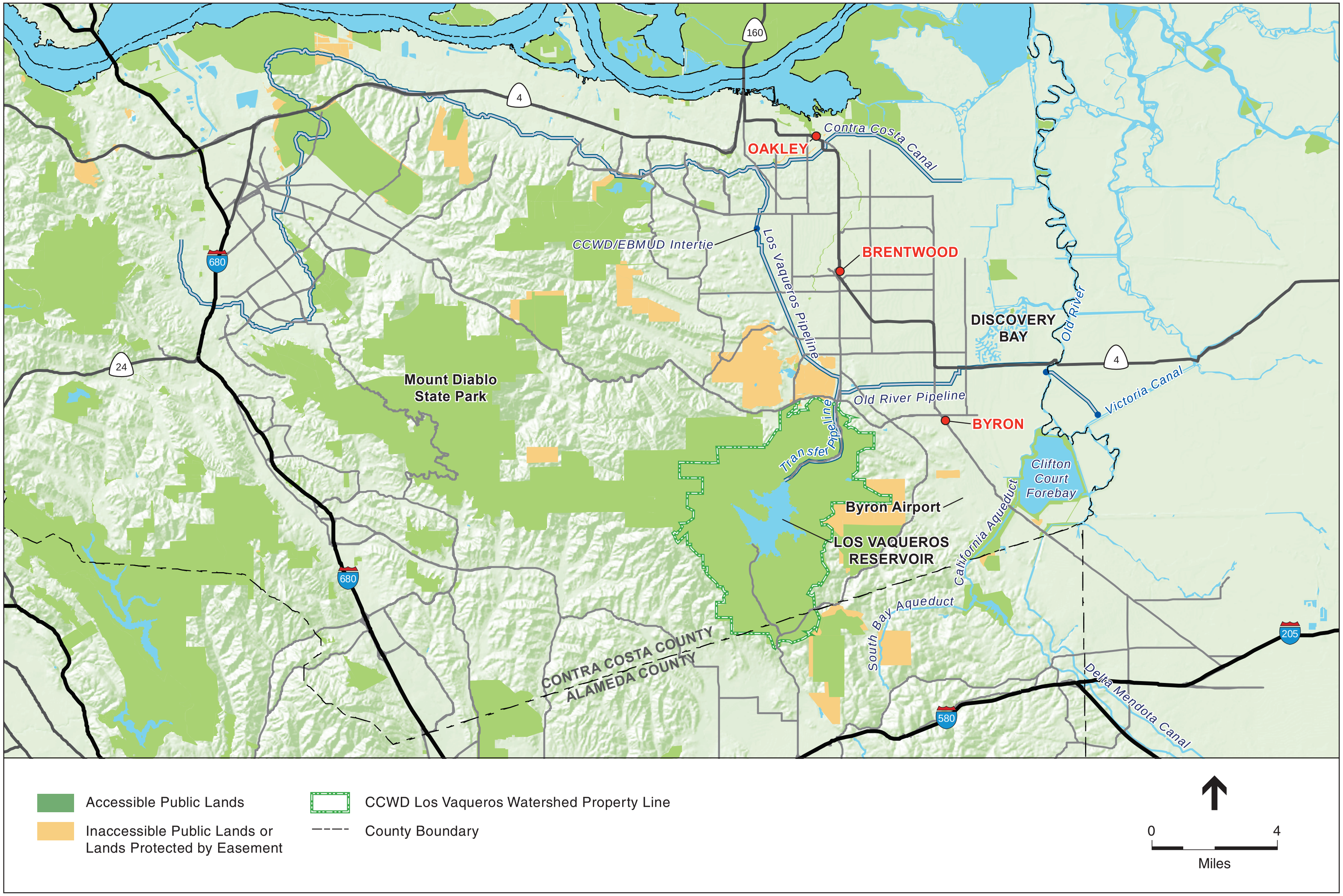
P-1. Impacts associated with construction of transmission lines and utilities can be mitigated by locating new construction in existing utility or transportation corridors, or along property lines, and by minimizing construction impacts. Before new transmission lines are constructed, the utility should determine whether an existing line has available capacity. To minimize impacts on agricultural practices, utility lines shall follow edges of fields. Pipelines in utility corridors or existing rights-of-way shall be buried to avoid adverse impacts to terrestrial wildlife. Pipelines crossing agricultural areas shall be buried deep enough to avoid conflicts with normal agricultural or construction activities. Utilities shall be designed and constructed to minimize any detrimental effect on levee integrity or maintenance (DWR, 1995).

Proposed project facilities within the Secondary Zone of the Delta include Delta Intake Facilities (both the existing Old River Intake and Pump Station and the new Delta Intake and Pump Station); most of the Delta-Transfer Pipeline; most of the Western Power Supply facilities including a potential Western Substation under Power Option 1 (Western Only); and the portion of the Transfer-Bethany Pipeline closest to the California Aqueduct (Eastside Option).

Local

As a special district that provides public utility services, CCWD is typically exempt (under Government Code Section 53091 et seq.*)* from local zoning and building ordinances. In addition, Sections 53091 and 53096 of the code exempt the location or construction of facilities for the production, generation, storage, treatment, or transmission of water from regulation under local zoning ordinances and (according to case law) general plans. There may be other local plans and regulations with which the proposed action and alternatives would need to be in compliance. Under other Government Code sections (Sections 65401 and 65402), CCWD is required to report to the local planning jurisdiction (i.e., city or county) any land acquisition or disposal, or the construction of any public building or structure, if a locally adopted general plan or part thereof is applicable to the proposed activity. The affected city or county has a period to review, comment, and make a determination of whether a proposed activity is consistent with its general plan; however, CCWD's Board of Directors can overrule this determination by a four-fifths vote.

Throughout this Environmental Impact Statement/Environmental Impact Report (EIS/EIR), local planning documents and relevant policies are discussed to provide additional information to the public, other agencies, and decision-makers, although these plans and policies may not be directly applicable to CCWD and the proposed project. **Figure 4.7-1** shows the communities in the vicinity of the Los Vaqueros Expansion Project.



SOURCE: USGS, 1993 (base map); Contra Costa County, 2005; and ESA, 2007

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Figure 4.7-1
Communities in the Vicinity of the Los Vaqueros Expansion Project

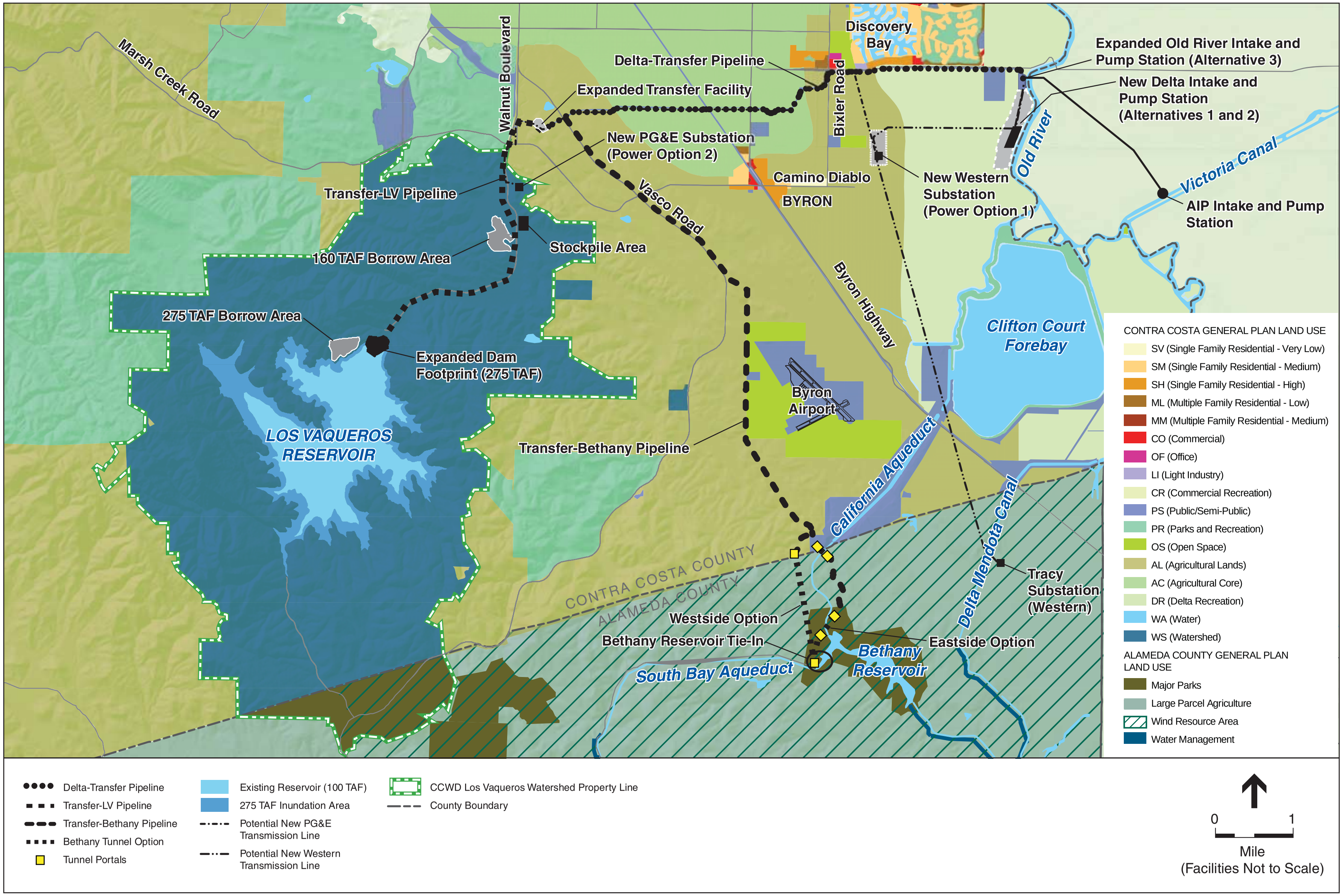
Contra Costa County General Plan

The Contra Costa County General Plan identifies goals, policies, and implementation measures related to the future development of unincorporated areas of the county. The General Plan provides overall policy direction as well as providing adopted land use policies specific to the East County Area and to the Southeast County Area (a part of the East County Area). The East County geographic area covers the eastern quarter of the county, which includes all proposed project components, while the Southeast County area covers the Los Vaqueros Watershed and also east and south to the county line (Contra Costa County, 2005a). Although the East County Area covers the northern portion of the project area, East County Area policies address land development near Oakley and in the Primary Zone of the Delta, and do not include topics relevant to the proposed project; therefore, policies for the East County Area are not discussed further in this EIS/EIR.

Adopted Southeast County Area policies in the General Plan address protection of natural and cultural resources that lie within the planning area for CCWD (Policy 3-70) and Los Vaqueros Reservoir (Policy 3-73). The full text of these policies is provided in Appendix E-2 of this EIS/EIR. Land use categories in the project area within Contra Costa County include Watershed, Agricultural Lands, Agricultural Core, Delta Recreation, Parks and Recreation, and Public/Semi-Public. These six categories are described below. Additional Southeast County Area policies include the preservation of agricultural and watershed areas for public uses, while allowing other uses in the area such as wind energy farms, mineral extraction, and reservoirs (Policy 3-68). Policy 3-69 indicates that pipelines and transmission lines are considered generally consistent with planned agricultural areas, subject to specific project review and county land use policies.

All anticipated project facilities would be outside of the county's Urban Limit Line (ULL). The ULL, which includes the unincorporated towns of Byron and Discovery Bay, is an established boundary beyond which no urban land uses can be established. The ULL ensures that non-urban agricultural, open space and other areas are preserved. **Figure 4.7-2** shows both the Contra Costa County General Plan and Alameda County "East County Area Plan (ECAP): A Portion of the Alameda County General Plan" land use designations for the project area (see subsection on ECAP below). ECAP serves as the general plan policy document for the area of Alameda County where a portion of the Transfer-Bethany Pipeline would be located.

Watershed. The Watershed designation primarily covers land owned by the two major water suppliers in Contra Costa County: the East Bay Municipal Utility District and CCWD. CCWD lands surrounding Los Vaqueros Reservoir are designated in the general plan as Watershed (see Figure 4.7-2). The purpose of the Watershed designation is to protect public water supplies. Uses within Watershed areas include public water supplies stored in reservoirs, such as the Los Vaqueros Reservoir. To safeguard such reservoirs, uses in Watershed areas are limited to livestock grazing; intensive agriculture that does not rely on pesticides or other chemical fertilizers; passive, low-intensity recreational uses such as hiking and biking; and small-scale commercial uses that support picnicking, boating, and fishing activities on the adjacent reservoirs (Contra Costa County, 2005a).



SOURCE: USGS, 1993 (base map); Alameda County, 2002; and ESA, 2008

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Figure 4.7-2
General Plan Land Uses

Proposed project facilities in the Watershed designation include the Los Vaqueros Reservoir Expansion/Dam Modifications with its Appurtenant Facilities (i.e., spillway, inlet-outlet works, and hypolimnetic oxygenation System), reservoir inundation areas, and borrow areas. Most of the Transfer-LV Pipeline, the westernmost electrical facilities (including a potential PG&E substation under Power Supply Option 2 [Western & PG&E]), and all CCWD recreational facilities (Marina Complex, Interpretive Center, hiking trails, access, and other facilities) are also in watershed-designated areas. Temporary construction facilities in the watershed designated area include staging areas and a stockpile area.

Agricultural Lands. The Agricultural Lands designation covers most of the privately owned rural lands in the county that are not composed of prime soils or located in or near the Delta. The purpose of the Agricultural Lands designation is to preserve and protect lands capable of and generally used for the production of food, fiber, and plant materials. This land use designation is not intended to exclude or limit other types of agricultural, open space, or non-urban uses. Additionally, allowable uses identified for lands under the Agricultural Core, Delta Recreation and Resources, Watershed, Parks and Recreation, and Open Space designations are allowed within Agricultural Lands. This includes water supply reservoirs and supporting pipelines and transmission lines (subject to specific project review) which are also allowed under the Watershed designation. The maximum allowable density in this category is one dwelling unit per 5 acres. Within Contra Costa County, a large portion of the area east of the Los Vaqueros administrative watershed boundary is designated as Agricultural Land. Much of this land is hilly and used for grazing livestock or for dry-grain farming.

Proposed Conveyance Facilities within the Agricultural Lands designated area include portions of the Delta-Transfer Pipeline; all of the Transfer Facility Expansion area; part of the Transfer-LV Pipeline; and the large majority of the Transfer-Bethany Pipeline to the Alameda County border. Proposed electrical supply facilities in the Agricultural Lands designated area include transmission lines and a potential Western Substation under Power Option 1 (Western Only) as well as some of the transmission lines under Power Option 2 (Western & PG&E).

Agricultural Core. The Agricultural Core designation applies to agricultural lands that are composed primarily of prime (Class I or II) soils, as identified by the Land Use Capability Classifications of the Natural Resources Conservation Service. Prime soils are considered to be the very best soils for farming a wide variety of crops. Lands designated as Agricultural Core lie to the east of the city of Brentwood, west of the town of Discovery Bay, and north of the town of Byron. Much of the land in this designation is being actively cultivated with intensive row crops.

The purpose of the Agricultural Core designation is to preserve and protect the county's farmlands that are the most capable of, and that are generally used for, the production of food, fiber, and plant materials. The Agricultural Core designation helps maintain economically viable, commercial agricultural units by requiring a higher minimum parcel size than the Agricultural Lands designation. Minor subdivisions and "ranchette" housing development are specifically discouraged.

The uses that are allowed in the Agricultural Core designation are generally the same as those allowed in the Agricultural Lands designation. The County General Plan discourages the placement of public roadways or new utility corridors that would adversely affect the viability of Agricultural Core lands, if economically feasible alternatives exist (Contra Costa County, 2005a).

Proposed project facilities within the Agricultural Core designation include a portion of the Delta-Transfer Pipeline and power transmission lines which will follow the same alignment as the pipeline. Both the Delta-Transfer Pipeline and the powerlines will be in an existing utility easement along State Route 4 (SR 4) or other existing roadway, and would not necessitate a new utility corridor.

Delta Recreation and Resources. The Delta Recreation and Resources land use designation encompasses the islands and adjacent lowlands of the San Joaquin–Sacramento Delta. In the vicinity of the proposed project, Delta Recreation and Resources lands are east and south of the town of Discovery Bay, extending south to Clifton Court Forebay. Delta Recreation and Resources lands are also east and south of Clifton Court Forebay. Much of the land designated as Delta Recreation and Resources is currently in agricultural production.

The Delta Recreation and Resources designation was created to balance the recreational opportunities in the area with the need to allow only low-intensity uses that will not subject residents or visitors to the flood dangers associated with the Delta. Agriculture and wildlife habitat are considered the most appropriate uses in the area; limited recreation uses that do not conflict with the predominant agricultural and habitat uses are also allowed.

Uses that may be allowed through the issuance of a land use permit include: marinas, shooting ranges, duck and other hunting clubs, campgrounds, and other outdoor recreation complexes. Conditional uses allowed on Delta Recreation and Resources lands are limited to uses that do not rely on urban levels of service or infrastructure (i.e., need a public water or sewer system) and that will not draw large numbers of people to flood-prone areas (Contra Costa County, 2005a).

Proposed project facilities within the Delta Recreation and Resources designation include the new Delta Intake and Pump Station, the eastern portion of the Delta-Transfer Pipeline, and a small portion of the transmission line under Power Option 1 (Western only).

Parks and Recreation. The Parks and Recreation designation includes publicly owned city, county, CCWD, and regional park facilities. Public and privately owned golf courses are also designated as Parks and Recreation.

Allowable uses in the Parks and Recreation land use designation are passive and active recreation-oriented activities and associated commercial uses such as snack bars and restaurants. This General Plan designation does not allow new privately owned residences or commercial uses or the subdivision of land (Contra Costa County, 2005a).

Less than 1 acre of a temporary construction easement for the Transfer-LV Pipeline would extend into Parks and Recreation designated land next to Walnut Boulevard.

Public/Semi-Public. The Public and Semi-Public land use designation includes properties owned by public governmental agencies (i.e., CCWD), public transportation corridors, and privately owned transportation. Allowable land uses include transportation and utility corridors, such as railroads, PG&E lines, and pipelines. This General Plan category allows a wide variety of public and private uses. Private residences, private commercial uses, and the subdivision of land are not considered compatible with this designation (Contra Costa County, 2005).

Proposed project facilities within the Public/Semi-Public land use designation include the existing Old River Intake and Pump Station, a small portion of the Delta-Transfer Pipeline, and possibly a portion of the Transfer-Bethany Pipeline under its Eastside Option, near the California Aqueduct. The Byron Airport, a county-owned general aviation airport, also occurs under this designation.

Alameda East County Area Plan – A Portion of the Alameda County General Plan

The ECAP was adopted in 1994 and most recently updated in 2002 as a portion of Alameda County's General Plan. The purpose of the ECAP is to present a clear statement of Alameda County's intent concerning future development and resource conservation within East County. East County (formerly called the Livermore-Amador Valley Planning Unit) encompasses 418 square miles of eastern Alameda County and includes the cities of Dublin, Livermore, Pleasanton, and a portion of Hayward as well as surrounding unincorporated areas. The planning area extends from the Pleasanton/Dublin ridgeline on the west to the San Joaquin County line on the east, and from the Contra Costa County line on the north to the Santa Clara County line on the south.

ECAP's primary goal is to "clearly delineate areas suitable for urban development and open space areas for long-term protection of natural resources, agriculture, and public safety." It implements its stated purpose through emphasis on use of land outside of urban growth boundaries for non-urban purposes (Alameda County, 2002). Other goals pertain to the protection of regionally significant open space (Open Space Goal), the maximization of long-term productivity of East County's agricultural resources (Agriculture Goal), the protection of watershed lands from the direct and indirect effects of development (Watershed Goal), and the protection of biological and scenic resources (Biological Resources and Scenic Viewsheds Goals) (Alameda County, 2002). These goals and policies are listed in Appendix E-1 of this EIS/EIR.

The geographic area of the ECAP includes the southernmost portion of the two Transfer-Bethany Pipeline alignment options (Westside Option and Eastside Option). Both Transfer-Bethany Pipeline Options cross ECAP land areas designated Large Parcel Agriculture, Major Parks, and Wind Resource Area, all defined below. The Los Vaqueros Reservoir Expansion Project is outside of the ECAP Urban Growth Boundary.

Large Parcel Agriculture. This land use designation permits agricultural uses, agricultural processing facilities, limited agricultural support service uses, secondary residential units, visitor-serving commercial facilities, recreational uses, public and quasi-public uses, solid waste landfills and related waste management facilities, quarries, wind farms, and related facilities, utility corridors, and similar uses compatible with agriculture (Alameda County, 2002). Portions of both potential Transfer–Bethany Pipeline alignments (Westside Option and Eastside Option) are within lands designated as Large Parcel Agriculture.

Major Parks. The Major Parks land use designation provides for existing and planned public parks, open space, and recreational uses including community, subregional, and regional facilities (Alameda County, 2002). The existing Bethany Reservoir and portions of both the Westside and Eastside Options for the Transfer-Bethany Pipeline are within the Major Parks designation area.

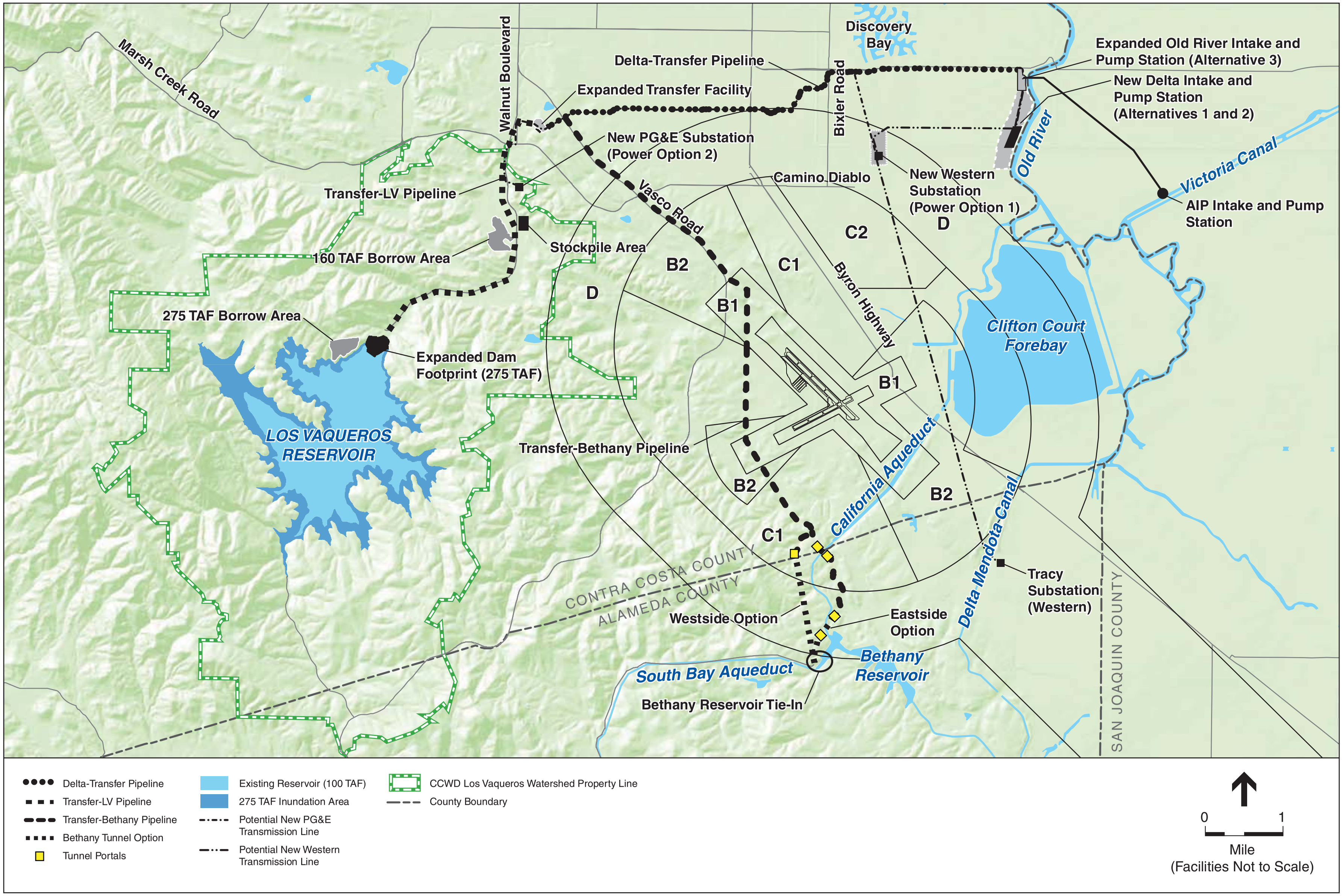
Wind Resource Area. The Wind Resource Area overlays much of the Large Parcel Agriculture and the Major Parks land use designations. Policy 173 of the ECAP discourages the development of uses and structures within areas designated as a Wind Resource Area that are not compatible with wind-energy operations. Currently, in addition to wind energy facilities, agriculture is the primary use in this area (Alameda County, 2002). The existing Bethany Reservoir and portions of both the Westside and Eastside Options for the Transfer-Bethany Pipeline are within the Wind Resource Area.

Contra Costa County Airport Land Use Compatibility Plan

The Contra Costa County Airport Land Use Compatibility Plan (ALUCP) serves as a planning tool to promote compatibility between airports in Contra Costa County and the surrounding land uses. The Contra Costa County Airport Land Use Commission adopted an ALUCP in December 2000. The Commission uses the ALUCP to review airport and adjacent land use development proposals. Other local agencies use compatibility criteria included in the ALUCP to prepare or amend their land use plans and ordinances (ALUCP, 2000). According to the State Aviation Act, General Plans must be made consistent with the ALUCP within 18 months of its adoption.

The Contra Costa County ALUCP presents land use policies that pertain only to the Airport Influence Area (AIA) associated with two airports: Buchanan Field Airport (in western Contra Costa County) and Byron Airport. The AIA associated with each airport includes the area that could be affected by aircraft noise, safety, overflight impacts, or potential hazards to aircraft. The AIA for each airport extends about 2 to 3 miles from the airport runways. Byron Airport is about 1 mile east of the Transfer-Bethany Pipeline alignment along Vasco Road, and 3 miles south of the Delta-Transfer Pipeline along SR 4. In addition, about 1 mile east of the airport, a 69 kilovolt (kV) electrical power line is proposed for construction within an existing transmission corridor under Power Option 1 (Western Only). **Figure 4.7-3** shows these pipelines and the transmission line in the vicinity of Byron Airport and within the ALUCP compatibility zones.

ALUCP policies identify potential limitations associated with land uses, building designs, structure heights, and population densities and intensities for areas near the Byron Airport, and typically require the Airport Land Use Commission to review proposed objects within the AIA. Height limitations, which are relevant to the proposed project power line poles, range from 35 feet for areas closest to the runway (Zone B1) to 70 feet (Zone B2) to 100 feet (Zones C1, C2, and D). Additional limitations are set with regard to noise exposure (addressed in Section 4.11) and Hazards to Flight (Policy 6.9.3) such as water bodies or landscape features to attract birds and electrical hazards. The Compatibility Criteria for Zones B1, B2, C1, C2, D, and "All Zones" is included in Appendix E of this EIS/EIR (ALUCP, 2000).



SOURCE: Shutt Moen Associates, 1998; and ESA, 2008

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Figure 4.7-3
Byron Airport Land Use Compatibility Zones

The ALUCP includes countywide policies, which apply to the AIA associated with both airports, and airport-specific policies that apply only to the AIA for Byron Airport. The applicable county-wide and airport-specific policies are summarized below:

Countywide Policies

4.3.1. Basis for Height Limits — To protect the airspace necessary for the operation of aircraft approaching, departing, or otherwise flying in the vicinity of airports, limits must be set on the height of objects on the land below. The basic criteria for limiting the height of structures, trees, and other objects near airports are set by federal regulations: Part 77, Subpart C, of the Federal Aviation Regulations (FAR); the United States Standard for Terminal Instrument Procedures (TERPS); and applicable airport design standards.

(a) Unless specific exceptions have been evaluated and determined not to adversely affect air navigation, these criteria as applied to Buchanan Field Airport and Byron Airport shall be used as the basis for setting limits on the heights of objects in the vicinity of those airports.

(b) Airspace plans depicting the critical areas for airspace protection around Buchanan Field and Byron Airport are depicted in Chapters 3 and 4, respectively.

4.3.2. Height Limit Exceptions — In all parts of the AIA for both Buchanan Field and Byron Airport, proposed structures may be allowed to exceed the criteria stated in the height limit policies for the respective airport, subject to review and approval by the ALUC on a case-by-case basis.

(a) A detailed airspace analysis, including a Federal Aviation Administration aeronautical study, shall be required. The analysis shall assess the potential affect of the proposed structure on instrument approach procedures, airport utility, and overall aviation safety. Consideration shall also be given to the potential effects on new or enhanced instrument approach procedures which may be developed in the future as indicated on the adopted airport layout plan.

(b) The FAA and/or the Contra Costa County Airport Land Use Commission may require marking and lighting of any objects for which a height limit exception is granted. Any such marking and lighting shall be done in a manner consistent with applicable FAA standards.

4.3.4. FAA Notification — Proponents of a project which may exceed a Part 77 surface must notify the FAA as required by FAR Part 77, Subpart B, and by the State Aeronautics Act, Sections 21658 and 21659. (Notification to the FAA under FAR Part 77, Subpart B, is required even for certain proposed construction that does not exceed the height limits allowed by Subpart C of the regulations.)

(a) Local jurisdictions shall inform project proponents of the requirements for notification to the Federal Aviation Administration.

(b) The requirement for notification to the FAA shall not necessarily trigger an airport compatibility review of an individual project by the Airport Land Use Commission unless required in accordance with the Buchanan Field Airport or Byron Airport airspace protection and height limit policies set forth in Chapters 3 and 4.

(c) Any project submitted to the ALUC for airport land use compatibility review for reason of height-limit issues shall include a copy of FAR Part 77 notification to the Federal Aviation Administration and the results of the FAA's analysis.

4.3.6. Other Flight Hazards — Land uses which may cause visual, electronic, or bird strike hazards to aircraft in flight shall not be permitted within any airport's influence area. Specific characteristics to be avoided include:

(a) Glare or distracting lights which could be mistaken for airport lights;

(b) Sources of dust, steam, or smoke which may impair pilot visibility;

(c) Sources of electrical interference with aircraft communications or navigation; and

(d) Any use, especially landfills and certain agricultural uses, which may attract an increased number of birds. (Refer to FAA Advisory Circular No. 150/5300-33B, *Hazardous Wildlife Attractants On or Near Airports*, and Order No. 5200.5A, *Waste Disposal Sites On or Near Airports* for specific guidelines.)

Policies Specific to Byron Airport

6.3 Compatibility Zone 'B1' Criteria

6.3.4. Height Limitations — Unless a specific exemption is granted (see Countywide Policy 4.3.2.), the height of objects within Compatibility Zone B1 shall be limited in accordance with the Byron Airport Airspace Protection Surfaces drawing.

(a) Generally, there is no concern with regard to any object up to 35 feet tall.

(b) ALUC review is required for any proposed object taller than 35 feet.

6.4 Compatibility Zone 'B2' Criteria

6.4.4. Height Limitations — Unless a specific exemption is granted (see Countywide Policy 4.3.2.), the height of objects within Compatibility Zone B2 shall be limited in accordance with the Byron Airport Airspace Protection Surfaces drawing.

(a) Generally, there is no concern with regard to any object up to 70 feet tall unless it is located on high ground or it is a solitary object (e.g., an antenna) more than 35 feet taller than other nearby objects.

(b) ALUC review is required for any proposed object taller than 70 feet.

6.5. Compatibility Zone 'C1' Criteria

6.5.4. Height Limitations — Unless a specific exemption is granted (see Countywide Policy 4.3.2.), the height of objects within Compatibility Zone C1 shall be limited in accordance with the Byron Airport Airspace Protection Surfaces drawing.

(a) Generally, there is no concern with regard to any object up to 100 feet tall unless it is located on high ground or it is a solitary object (e.g., an antenna) more than 35 feet taller than other nearby objects.

(b) ALUC review is required for any proposed object taller than 100 feet.

6.7. Compatibility Zone 'D' Criteria

6.7.4. Height Limitations — See criteria for Compatibility Zone C1.

6.9. Compatibility Criteria — All Zones

6.9.3. Hazards to Flight — No land use which would result in an increased attraction of birds or would create a visual or electronic hazard to flight shall be permitted anywhere within the Byron Airport influence area. (See Countywide Policy 4.3.6.)

Reclamation District 800

The Reclamation District Law (Water Code Section 50000 et seq.) provides a means for local entities to form reclamation districts to finance the reclamation of land that has been made unusable by overflow or flooding. Reclamation districts assess fees from members of their district to finance services and facilities related to land reclamation, such as levees and irrigation and drainage facilities. Construction activities associated with the proposed new Delta Intake and Pump Station would occur on levees next to Old River and within Byron Tract. Byron Tract is under the jurisdiction of Reclamation District 800. Because the new intake would require levee work, project construction could be subject to review and approval of an encroachment permit and maintenance easement by Reclamation District 800.

Existing Land Uses

The eastern portions of Contra Costa and Alameda Counties primarily consists of lands used for agriculture, grazing, and recreation. Most of the upland areas are used for grazing rather than crops. Irrigated agricultural production is limited to the lands north and east of Los Vaqueros Reservoir and toward the Delta. Urban areas in eastern Contra Costa and Alameda Counties are limited to the cities of Brentwood, Oakley, and Livermore, plus the unincorporated communities of Byron and the town of Discovery Bay. Only Brentwood, Byron, and Discovery Bay are in the immediate project area.

The nearest incorporated city is Brentwood, with its city limits about 4 miles north of Los Vaqueros Reservoir. The unincorporated community of Byron is about 5 miles northeast of the reservoir. The Byron Airport is south of Byron. The unincorporated town of Discovery Bay is about 1 mile northeast of Byron. In Alameda County, the nearest urban area is Livermore, about 7 miles south of Los Vaqueros Reservoir. Nearby communities are identified in Figure 4.7-1. Rural residential properties are scattered throughout agricultural portions of the project area, and some residences are near portions of the proposed pipeline alignments.

The Los Vaqueros Watershed, depicted on Figure 4.7-2, is owned and administered by the CCWD and is accessible to the public. Large areas of publicly held land lie within the project vicinity. Next to the reservoir watershed are Brushy Peak Regional Preserve (2,014 acres), Vasco Caves Regional Preserve (1,426 acres), Cowell Ranch Open Space (3,687 acres), Round Valley Regional Preserve (1,895 acres), and Morgan Territory Regional Preserve (4,708 acres). Other nearby public lands include the Bethany Reservoir State Recreational Area (802 acres), Clifton Court Forebay (36 acres), and Mount Diablo State Park (18,839 acres) (see Figure 4.15-1). These lands (except for Clifton Court Forebay) are administered by the East Bay Regional Park District or the California State Parks systems. Clifton Court Forebay is owned and operated by the Department of Water Resources and generally has limited public access.

The Transfer-Bethany Pipeline (Eastside Option) would pass through about 0.3 mile of the Bethany Reservoir State Recreation Area but the public does not have access to the area where the project pipeline/tunnel construction would occur (see Section 4.15, Recreation, for further discussion of project effects on recreational areas and opportunities). No other proposed conveyance, power, or project facilities pass through these open space areas, preserves, or public lands.

Sensitive Land Uses

Some sensitive land uses, including the town of Discovery Bay residential community and Bethany Reservoir State Recreation Area, are near (i.e., within a half mile of), or within proposed project construction areas. No construction would occur within the cities of Brentwood or Livermore, or the unincorporated towns of Byron or Discovery Bay. No schools, hospitals, rest homes, or similar sensitive public or private land uses are in proximity to anticipated construction. The following list summarizes the location and number of residences near each proposed project area or facility site.

- *Los Vaqueros Watershed* – This area includes the reservoir expansion area, in-watershed facilities construction sites, borrow material and staging sites, and recreational facility sites. One residence off Los Vaqueros Road is about 2 miles south of the reservoir. There are also 12 residences on the ridge west of the watershed near Morgan Territory Road, about 1.6 miles from the reservoir and 3 miles from the reservoir dam site. In addition, several residences are about 2.5 miles northeast of the expanded dam site, off Silver Hills Drive near the north entrance to the watershed.

- *Delta Intake and Pump Station* – The sensitive land use closest to the existing Old River Intake and Pump Station is a house about 3,000 feet to the northwest along SR 4. The residence closest to the proposed new Delta Intake and Pump Station is a single farmhouse on the east side of Old River. This facility could be between 500 and 1,000 feet from this residence, depending on the location selected for it.

- *Delta-Transfer Pipeline* – Construction would occur along the south side of SR 4, as close as 50 feet from the town of Discovery Bay where as many as 120 residences are along the north side of SR 4 along the pipeline alignment. About 16 rural home sites lie within 50 feet of the 6.5-mile pipeline route as it passes along SR 4, Bixler Road, Kellogg Creek Road, and Hoffman Lane.

- *Transfer Facility Expansion* – The residence nearest to the Transfer Facility is along Walnut Avenue, about 1,450 feet west of the anticipated construction site.

- *Transfer-LV Pipeline* – About 5 rural residences along Camino Diablo and Walnut Avenue lie within 50 feet of the Transfer-LV Pipeline alignment.

- *Transfer-Bethany Pipeline* – An estimated 7 rural homesteads near Vasco Road or Armstrong Road lie as close as 50 feet to the Transfer-Bethany Pipeline alignment. The Bethany Reservoir State Recreation Area, with a bikeway along the California State Aqueduct, is along the pipeline alignment (Eastside Option) near the southern terminus of the pipeline. The project construction area at Bethany Reservoir for the tie-in is not accessible to the public and is over 300 feet from a public access area.

- *Power Option 1* – There would be no physical construction activity on the transmission line from Western's existing Tracy substation to the new substation in the project area. The existing Western transmission line would feed the new substation. The nearest rural residences are about 1,275 feet away from the new substation and upgraded transmission line to be extended from the new substation east to the new Delta Intake Pump Station. The new 21kV transmission line that would extend west to the Transfer Facility Expansion would be constructed along a portion of SR 4, in the same corridor as the Delta-Transfer Pipeline. An estimated 16 rural home sites lie within 50 feet of the proposed transmission lines.

- *Power Option 2* – Like Power Option 1, Power Option 2 would make use of Western's existing transmission line that extends northwest from its existing Tracy substation; no facility changes or new construction would occur along this existing transmission line. The existing Western transmission line that extends east to service the Old River Pump Station would be upgraded but this option does not include a new Western substation. About 4 rural home sites are 1,275 feet or more from the Western transmission line proposed for upgrade. A new overhead transmission line would be extended from PG&E's existing facilities in Brentwood, in the same corridor as the proposed Transfer-LV Pipeline. About 5 rural residences along Camino Diablo Road and Walnut Avenue lie within 50 feet of the joint transition line and pipeline alignment. The new PG&E substation required under this option would be on CCWD Los Vaqueros Watershed property. The residence nearest to this proposed substation lies within 500 feet of this property and is off Silver Hills Drive.

- *Recreation Facilities* – The recreation facilities that would be replaced and expanded within the Los Vaqueros Watershed would be near and around the reservoir. The homes closest to the reservoir include 12 residences on the ridge west of the watershed near Morgan Territory Road, about 1.6 miles from the reservoir and 3 miles from the Marina Complex site. A single residence off Los Vaqueros Road to the south is located about 2 miles from the reservoir and 4.8 miles from the proposed Marina Complex. In addition, several residences are about 2.5 miles northeast of the expanded dam site, off Silver Hills Drive near the north entrance to the watershed.

Although these sensitive land uses would not experience long-term impacts, a number of temporary construction impacts would affect residents and visitors to these areas. Potential construction impacts to sensitive users resulting from the proposed project are addressed in their respective sections: Agriculture (Section 4.8), Transportation and Circulation (Section 4.9), Air Quality (Section 4.10), Noise (Section 4.11), Visual/Aesthetic Resources (Section 4.14), and Recreation (Section 4.15).

4.7.2 Environmental Consequences

Methodology

For purposes of this environmental analysis, the EIS/EIR evaluates the potential for the project and alternatives to conflict with the Contra Costa County or Alameda County General Plan Land Use policies. The standard for determining whether a project component would conflict with a general plan policy use is based on the *General Plan Guidelines*, published by the Office of Planning and Research: "An action, program, or project is consistent with the general plan if, considering all its aspects, it will further the objectives and policies of the general plan and not obstruct their attainment" (OPR, 2003).

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. These thresholds also encompass the factors taken into account under the National Environmental Policy Act (NEPA) to determine the significance of an action in terms of its context and the intensity of its effects. A significant land use effect determination was applied to an alternative that would do any of the following:

- Physically divide an established community
- Conflict with any applicable land use plan, policy, or regulation of an agency adopted for the purpose of avoiding or mitigating a significant environmental effect
- Conflict with any applicable Habitat Conservation Plan (HCP) or Natural Community Conservation Plan (NCCP)

Discussions of consistency with land use and zoning designations are provided below for the proposed alternatives. As previously explained, CCWD is not subject to local general plan and zoning regulations. However, discussions of consistency with the land use designations of the general plans are provided to give context and to fully inform the public and the decision makers.

The potential for the project alternatives to conflict with applicable HCPs or NCCPs is addressed in Section 4.6, Biological Resources in the regulatory setting for local agencies and under Impact 4.6.17. The potential to conflict with HCPs and NCCPs is not discussed further in this section.

Impact Summary

Table 4.7-1 provides a summary of the impact analysis for issues related to land use based on actions outlined in Chapter 3.

TABLE 4.7-1
SUMMARY OF IMPACTS – LAND USE

	Project Alternatives			
Impact	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.7.1: The proposed project and alternatives would not physically divide an existing community.	NI	NI	NI	NI
4.7.2: Facility siting and operation under the proposed project and alternatives would not conflict with any applicable land use plans.	LS	LS	LS	LS
4.7.3: Construction activities within designated Airport Land Use Compatibility Zones near the Byron Airport could cause potential temporary height impacts by conflicting with FAR Part 77 surfaces during construction.	LSM	LSM	LSM	LS
4.7.4: Construction activities within the AIA for Byron Airport could cause potential temporary flight hazards through the creation of glare or distracting lights; the generation of dust or smoke, which could impair pilot visibility; or could attract an increased number of birds.	LSM	LSM	LSM	LSM
4.7.5: The proposed project and alternatives would not contribute to cumulative land use impacts.	NI	NI	NI	NI

NOTES:
SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact
AIA = Airport Influence Area
FAR = Federal Aviation Regulation

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no impacts related to land use would occur from implementing this alternative.

Impact 4.7.1: The proposed project and alternatives would not physically divide an existing community. (No Impact)

Alternative 1

The project area extends throughout southeastern Contra Costa County and northeastern Alameda County. As previously indicated, the city of Brentwood (in Contra Costa County) is about 4 miles north of the project area, and the city of Livermore (in Alameda County) is 7 miles south of the project area. Two established communities are in the project area — the towns of Byron and Discovery Bay. Numerous rural residential homes are scattered throughout the project area; however, for purposes of this Impact 4.7.1 assessment, they are not considered to be a community that would be subject to division.

Reservoir Expansion and Recreational Facilities. Alternative 1 involves a 275-thousand acre-foot (TAF) Reservoir Expansion/Dam Modification project with borrow areas, PG&E substation (under Power Option 2), and recreation facilities constructed within the CCWD Los Vaqueros Watershed property. Because facilities on existing CCWD watershed property would not affect existing local communities, they are not discussed further in this impact discussion. However, Alternative 1 would also involve construction of facilities in areas outside of the watershed, which are considered below.

Delta Intake and Pump Station. The new Delta Intake and Pump Station is in an agricultural area next to Old River, away from existing communities and other sensitive land uses. Therefore, construction of this facility would not divide an existing community.

Conveyance Facilities. Under Alternative 1, construction of three water conveyance pipelines and expansion of an existing Transfer Facility would occur. The Delta-Transfer Pipeline would be along SR 4, within an existing transportation corridor that passes south of the town of Discovery Bay. The Transfer Facility Expansion would occur on CCWD land next to the existing Transfer Facility, in an area surrounded by agricultural land and next to a quarry operation. Expansion of the Transfer Facility would not divide an existing community.

The Transfer-LV Pipeline alignment passes in close proximity to numerous individual residences, but not through an existing community. The Transfer-Bethany Pipeline would pass south along Vasco Road, avoiding the town of Byron, which is along the Byron Highway, to the east. Because all conveyance facilities would be outside of existing communities in largely rural, agricultural areas, and also because underground pipelines are easily traversable by roads, construction of project conveyance facilities would not result in the physical division of any established community.

Power Supply. To accommodate a new Delta Intake and Pump Station as well as the expansion of the Transfer Facility, additional overhead electrical powerlines and a substation would be required. Two options for electrical facilities currently under consideration include Power Option 1 (Western Only), and Power Option 2 (Western & PG&E). Construction of Power Option 1 includes a new power line from a new Western substation site to the new Delta Intake facilities, with a new Western substation at the eastern terminus of Camino Diablo Road. Power Option 2 would entail a new PG&E substation within the CCWD Los Vaqueros Watershed property in an area to the north of the staging area, plus a new distribution line connecting the new PG&E substation to the Expanded Transfer Facility.

Most of the proposed power facilities (with the exception of a new Western substation) would occur within an existing transmission line right-of-way or on watershed land. The alignment of Power Option 2 would be along SR 4 in an area west of the town of Discovery Bay. Because the new power facilities would be outside of existing communities in largely rural, agricultural areas, and also because overhead powerlines are easily traversable by roads, implementation of either option for electrical facilities would not result in the physical division of any established community.

Summary. All project construction under Alternative 1 would be in areas that avoid the two established communities in the project area — the towns of Byron and Discovery Bay. Moreover, the Conveyance and Power Supply Facilities are easily traversable. Alternative 1 would not physically divide an existing community.

Alternative 2

The facilities included in Alternative 2 would be the same as those under Alternative 1. Therefore, this alternative would not physically divide an existing community.

Alternative 3

Construction of Alternative 3 would include the same components as discussed for Alternative 1 with three substantive differences:

- Expansion of the Old River Intake and Pump Station would occur within the facility's existing site area.
- Alternative 3 would not include a new Delta Intake and Pump Station.
- Alternative 3 would not include the Transfer-Bethany Pipeline.

Expansion of the Old River Intake and Pump Station would not affect any existing communities or other sensitive land uses and therefore would not divide an existing community. While there would be no construction of the new Delta Intake and Pump Station or Transfer-Bethany Pipeline under Alternative 3, this would not reduce the level of impact as compared to Alternative 1 because no communities or sensitive land uses would be affected by these facilities. As with Alternative 1, Alternative 3 would not physically divide an existing community or affect sensitive land uses, and no impacts would occur.

Alternative 4

Alternative 4 would involve a 160-TAF Reservoir Expansion with a borrow area and recreational facilities to be constructed within the CCWD Los Vaqueros Watershed property line. Under this alternative, the capacity of the existing Transfer Station would be expanded; however, the footprint of this facility would not be expanded, as would occur for other alternatives. Alternative 4 does not include construction of any Delta intake, conveyance or power supply facilities and, consequently, would not impact any existing communities. As with Alternative 1, this alternative would not physically divide an existing community and no impact would occur.

Mitigation: None required.

Impact 4.7.2: Facility siting and operation under the proposed project and alternatives would not conflict with any existing land use plans. (Less than Significant)

Alternative 1

Land Use and Resource Management Plan for the Delta

No existing or proposed Los Vaqueros Reservoir Expansion project facilities are within the Primary Zone of the Delta. However, under Alternative 1, proposed project facilities in the Secondary Zone of the Delta would include the new Delta Intake Facilities; most of the Delta-Transfer Pipeline; most of the Western Power Supply facilities, including a potential Western substation, under Power Option 1 (Western Only); and the portion of the Transfer-Bethany Pipeline closest to the California Aqueduct under the Eastside Option.

As previously indicated under Regulatory Setting, the Secondary Zone is not within the planning area of the Delta Protection Commission, but the Commission may comment on development projects within the Secondary Zone in the event that a project in the Secondary Zone could affect lands within the Primary Zone. Policy recommendations related to development and activities within the Secondary Zone are provided in the Land Use and Utilities and Infrastructure sections of the Management Plan. These include recommendations to minimize impacts associated with construction of transmission lines and utilities by locating new construction in existing utility or transportation corridors, or along property lines, and by minimizing construction impacts. Plan policy recommendations for minimizing the effects of project construction in this area have either already been incorporated into project siting and design considerations, or are addressed by mitigation measures identified in the EIS/EIR to reduce significant construction effects. Proposed facilities would be within existing utility corridors and/or roadways, and/or along property lines, to minimize further land fragmentation. Also, activities have been identified to address construction effects such as erosion and stormwater runoff. As a result, the project would be consistent with policies of the *Land Use and Resource Management Plan for the Delta*.

Contra Costa County General Plan

Los Vaqueros Reservoir Expansion/Dam Modifications and Recreation Facilities. The Contra Costa County General Plan designates CCWD's Los Vaqueros Watershed property as Watershed. According to the County General Plan, CCWD lands in the Watershed category include properties acquired for Los Vaqueros Reservoir in the southeastern portion of the county. The Expanded Los Vaqueros Reservoir is consistent with the Watershed designation because it is supporting protection of water supply and the existing reservoir, which is the purpose of the designation according to the County General Plan. Passive, low-intensity recreational uses such as hiking and biking; and small-scale commercial uses that support picnicking, boating, and fishing activities at the Los Vaqueros Reservoir are also recognized as consistent with Watershed designated lands.

Delta Intake and Pump Station. The new Delta Intake and Pump Station would be on land designated as Delta Recreation and Resources in the Contra Costa County General Plan. The Delta Recreation and Resources designation was created to balance the recreational opportunities in the area with the need to allow only low-intensity uses that will not subject residents or visitors to the flood dangers associated with the Delta. The new Delta Intake and Pump Station would be consistent with the Delta Recreation designation because it would not draw in a large number of workers, residents, or visitors to a flood-prone area. CCWD does not have any employees working out of its intake facilities, and does not anticipate that it would have any permanent employees working out of its intakes in the future. Also, as discussed in Section 4.5, Local Hydrology, Drainage, and Groundwater under Impact 4.5.5, the new Delta Intake and Pump Station would be located in the 500-year flood zone as defined by the Federal Emergency Management Agency (FEMA). The area is protected from the 100-year flood hazards by the existing levee along Old River. The proposed project includes improvements to the levee in the area of the new Delta Intake and Pump Station that would enhance the flood protection for this facility. An earthen setback levee (or ring levee around the site) would be installed for protection during construction and would remain as a permanent structure to provide secondary containment of Old River in the event of a flood in the area. This facility would be protected from flood flows but would not impede or redirect flood flows.

Conveyance Facilities. Under Alternative 1, project pipelines and the Transfer Facility Expansion would occur on land use areas designated as follows:

- The Delta-Transfer Pipeline would pass through lands designated as Delta Recreation, Public/Semi-Public, Agricultural Lands, and Agricultural Core.
- The Transfer Facility Expansion Area would be on lands designated as Agricultural Lands in the Contra Costa County General Plan.
- Transfer-LV Pipeline would occur on lands designated as Watershed, Agricultural Lands, and Parks and Recreation in the Contra Costa County General Plan.
- The Transfer-Bethany Pipeline would pass through lands designated as Agricultural Lands and Public/Semi-Public in the Contra Costa County General Plan.

The descriptions of each of these land use designations can be found in the Regulatory Setting section of this chapter. The Watershed, Parks and Recreation, and Public/Semi-Public designations specify that public utilities are an included use. Also, county policies indicate that allowable uses identified for lands under the Agricultural Core, Delta Recreation and Resources, Watershed, Parks and Recreation, and Open Space designations are allowed within Agricultural Lands. This includes water supply reservoirs, pipelines, and transmission lines. Furthermore, construction of underground water pipelines and a transfer facility would be consistent with the Contra Costa General Plan in the following respects:

- Because installation of water pipelines is instrumental to implementing a water supply reservoir, which is a designated use;
- Because the facilities would be publicly owned and operated (by CCWD);
- Because pipelines through agricultural and recreational areas would not preclude continued farming or recreation on the overlying land; and
- Because policies for the Southeast County Area (3-69) indicate that, subject to specific project review, pipelines and transmission lines are generally consistent with planned agricultural areas.

Power Supply. To accommodate a new Delta Intake and Pump Station as well as the expansion of the Transfer Facility, additional overhead electrical powerlines and a substation would be required. The two options for electrical facilities currently under consideration include Power Option 1 (Western Only), and Power Option 2 (Western & PG&E). Construction of Power Option 1 includes additional powerlines from the proposed site of the Western substation to the new Delta Intake and Pump Station. Under Power Option 1, a new Western substation would be sited at the eastern terminus of Camino Diablo Road. Power Option 2 would entail a new PG&E substation within the CCWD Watershed property in an area to the north of the staging area, plus a new distribution line connecting the new PG&E substation to the Expanded Transfer Facility. Most of the proposed power facilities (with the exception of a new Western substation) would occur within existing utility easements or on Watershed designated land.

Power supply overhead lines would pass through lands designated Delta Recreation, Public/Semi-Public, Agricultural Lands, Agricultural Core, and Watershed. The Western Substation would be on land designated Delta Recreation and the PG&E substation would be on land designated Watershed. For the same reasons that underground pipelines would be consistent with these Contra Costa General Plan land use designations, power supply facilities would also be consistent with the Plan. Specifically, construction of overhead powerlines and a potential Western substation (under Power Option 1) would be consistent with the Contra Costa General Plan in the following respects:

- Because installation of transmission lines is instrumental to implementing a water supply reservoir, which is a designated use;
- Because the facilities would be publicly owned and operated (by Western and PG&E);

- Because utilities passing through agricultural and recreational areas would not preclude continued farming or recreation on the overlying land; and
- Because policies for the Southeast County Area (3-69) indicate that, subject to specific project review, pipelines and transmission lines are generally consistent with planned agricultural areas.

Alameda East County Area Plan – A Portion of the Alameda County General Plan

The portion of the Transfer-Bethany Pipeline (both Westside and Eastside Options) in Alameda County is in areas designated by the Alameda ECAP as Large Parcel Agriculture and the area around Bethany Reservoir is designated as Major Parks. This area of Alameda County is also a designated Wind Resource Area overlay. The descriptions of each of these land use designations can be found in the preceding Regulatory Setting section. The pipeline would be consistent with the Large Parcel Agriculture designation because installation of an underground pipeline would not create parcels smaller than required under this designation or preclude continued agricultural use (primarily grazing) on the overlying land. The pipeline would be consistent with the Major Parks Designation because it is a public water pipeline to be connected with state water facilities within the reservoir area and would not interfere with recreational uses at the Bethany Reservoir State Recreation Area. Furthermore**,** the proposed pipeline would be consistent with the Wind Resource Overlay because installation of an underground pipeline would not interfere with existing or future wind turbine operations.

Contra Costa County Airport Land Use Compatibility Plan

Under Alternative 1, the Delta-Transfer Pipeline would be on the edge of ALUCP Compatibility Zone D. The Transfer-Bethany Pipeline would pass through several ALUCP compatibility zones in the vicinity of Byron Airport (Compatibility Zones B2, C1, C2, and D).

With respect to project consistency with ALUCP policies during long-term project operations, these pipelines would be buried, underground facilities. Because these pipelines would be underground, with only limited aboveground support structures (i.e., blow-off and air valves that stand about 2 feet above ground and are spaced about every 1,000 to 2,000 feet along the pipeline), they would be consistent with the ALUCP. Additionally, people would not be permanently placed at this location for this potential pipeline

The only major aboveground facility with the potential to be constructed near the Byron Airport would be the 69 kV electrical power transmission line, about 1.5 miles east of the runway. The transmission lines for Power Option 1 (Western Only) would pass through Compatibility Zones B1, B2, C1, and D, and a potential Western Substation would be within Compatibility Zone D. Because the potential new powerlines (anticipated to be 50 feet high) would be within an existing transmission line corridor, they would not create any new hazards to aviation or conflict with ALUCP policies. The proposed substation would be less than 50 feet tall.

S**ummary.** Alternative 1 would not conflict with any applicable land use plan adopted for the purpose of avoiding or mitigating a significant environmental effect.

Alternative 2

The land use plans and locations of facilities under Alternative 2 would be the same as described for Alternative 1. Impacts related to project compatibility with land use plans under Alternative 2 would be the same as described for Alternative 1. Facility siting and operation would be consistent with land use plans and policies.

Alternative 3

Alternative 3 would implement similar facilities as compared to Alternative 1, except that under Alternative 3, the new Delta Intake and Pump Station and the Transfer-Bethany Pipeline would not be constructed. However, it would expand the existing Old River Intake and Pump Station within that structure's existing footprint.

Land Use and Resource Management Plan for the Delta

The existing Old River Intake and Pump Station is within the Secondary Zone of the Delta. Under Alternative 3, Old River Intake and Pump Station Expansion would be consistent with the Land Use and Resource Management Plan for the Delta because the Management Plan policy recommendations for minimizing the effects of project construction in the Secondary Zone are already addressed by both the site location and by mitigation measures identified in the EIS/EIR to reduce significant construction effects. Expansion of this existing facility would occur within the existing property for this facility. The site is on and next to Old River, and expansion of the facility would not increase the overall area of the facility site or result on land fragmentation. Mitigation measures have been identified to address construction effects such as erosion and stormwater runoff. As a result, the project would be consistent with policies of the *Land Use and Resource Management Plan for the Delta*.

Contra Costa County General Plan

The existing intake facility is already on land designated in the Contra Costa County General Plan as Public/Semi-Public. The descriptions of this land use designation can be found in the preceding Regulatory Setting section. The proposed project includes on-site modifications to the Old River Intake and Pump Station that would be consistent with the Public/Semi-Public designation because the modified facility would continue to be owned and operated by a public entity, CCWD. Therefore, Alternative 3 (like Alternative 1) would be consistent with the land use designations in the Contra Costa County General Plan.

Alameda East County Area Plan – A Portion of the Alameda County General Plan

Under Alternative 3, no project facilities are in Alameda County.

Contra Costa County Airport Land Use Compatibility Plan

Under Alternative 3, the Delta-Transfer Pipeline would be on the edge of ALUCP Compatibility Zone D, the 69 kV electrical power transmission line alignment proposed under Power Option 1 (Western Only) would be about 1.5 miles east of the runway and would pass through Compatibility Zones 1, B2, C1, and D, and the proposed Western substation would be within Compatibility

Zone D. As discussed for Alternative 1, in the long term, facility siting and operation of the buried pipeline and additional power facilities in these zones around the airport would be consistent with the ALUCP policies.

In summary, facility siting and operation under Alternative 3 would be consistent with land use plans and policies.

Alternative 4

Alternative 4 would include a reduced reservoir expansion to 160 TAF; however, there would be no modifications to the Old River Intake and Pump Station, no construction of a new Delta Intake and Pump Station, and no new Conveyance or Power Supply facilities would be constructed. Modifications to Recreation Facilities would occur on lands within the CCWD Los Vaqueros Watershed property line.

Delta Management Plan

For Alternative 4, no changes are proposed to project facilities in the Secondary Zone of the Delta.

Contra Costa County General Plan

As discussed under Alternative 1, the Contra Costa County General Plan designates CCWD’s Los Vaqueros Watershed property as Watershed. The Expanded Los Vaqueros Reservoir is consistent with the Watershed designation because it supports protection of water supply, which is the purpose of the designation according to the County General Plan. The only project activity under Alternative 4 that would occur beyond the CCWD Los Vaqueros Watershed property line would be at the existing CCWD Transfer Facility and would involve only an on-site pump capacity upgrade which would not change its existing land use. This would be consistent with the area’s General Plan designation of Agricultural, which allows water supply pipelines.

Alameda East County Area Plan – A Portion of the Alameda County General Plan

For Alternative 4, no project facilities are in Alameda County.

Contra Costa County Airport Land Use Compatibility Plan

For Alternative 4, no proposed project facilities are within the Byron ALUCP area.

In summary, because all Alternative 4 construction would occur on property owned by CCWD and no land use changes would occur at the Transfer Facility, Alternative 4 would be consistent with all land use plans and policies.

Mitigation: None required.

Impact 4.7.3: Construction activities within designated Airport Land Use Compatibility Zones near the Byron Airport could cause potential temporary height impacts by conflicting with FAR Part 77 surfaces during construction. (Less than Significant with Mitigation for Alternatives 1, 2, and 3; Less than Significant for Alternative 4)

Alternative 1

Under Alternative 1, the Delta-Transfer Pipeline would be on the edge of ALUCP Compatibility Zone D. The Transfer-Bethany Pipeline would pass through several ALUCP compatibility zones in the vicinity of Byron Airport (Compatibility Zones B2, C1, C2, and D). The 69 kV electrical power transmission line would be constructed about 1.5 miles east of the runway. The transmission lines for Power Option 1 (Western Only) would pass through Compatibility Zones B1, B2, C1, and D, and a potential Western substation would be within Compatibility Zone D. As previously stated, new powerlines (anticipated to be up to 50 feet high) would be within an existing transmission line corridor and would not create any new hazards to aviation or conflict with ALUCP policies after construction.

As identified in ALUCP policies 6.3.4, 6.4.4, 6.5.4, 6.6.4, and 6.7.4, specific height restrictions are in place for Areas B1 (35 feet), B2 (70 feet), and C1, C2, and D (100 feet). However, it is important to note that these measurements refer to the difference between the height of the proposed object and the height of the runway end. Changes in topography could lead to variations in the allowable height of proposed objects based on the location.

Project construction will involve the use of cranes, drills, or other large construction equipment as tall as the lines that are being upgraded that have the potential to intrude into protected airspace (i.e., 35 feet or above). In addition, the location of these objects during equipment staging while they are not in use must be considered with respect to height restrictions and ALUCP policies. For example, the location of cranes and other equipment may require the use of lighting or other marking during nighttime hours, especially during the construction of the transmission line.

In summary, Alternative 1 would result in impacts related to construction within protected airspace associated with Byron Airport. This would be a significant impact.

Alternative 2

The facilities under Alternative 2 would be the same as described for Alternative 1. Impacts related to construction within protected airspace associated with Byron Airport under Alternative 2 would be the same as described for Alternative 1. Alternative 2 would have significant impacts related to construction within protected airspace associated with Byron Airport.

Alternative 3

Alternative 3 would implement similar facilities as under Alternative 1, except that Alternative 3 would not construct the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline but would expand the existing Old River Intake and Pump Station within that structure’s existing footprint. Pipeline, power supply, and other construction would occur in or near Byron Airport

Land Use Compatibility Zones. Alternative 3 would have significant impacts related to construction within protected airspace associated with Byron Airport.

Alternative 4

Alternative 4 would include a reduced reservoir expansion to 160 TAF; there would be no construction within the Byron Airport Land Use Compatibility Zones. Alternative 4 would have a less-than-significant impact related to construction within protected airspace associated with Byron Airport.

Mitigation Measure

Measure 4.7.3: Pursuant to ALUCP policy 4.3.4, CCWD shall notify the FAA, as required by FAR Part 77, Subpart B, of its proposed project to determine whether the proposed construction equipment and the location of construction activities and staging areas have the potential to intrude into protected airspace associated with Byron Airport. To facilitate FAA coordination, CCWD shall consult with County Airport staff. If necessary, CCWD will ensure that appropriate notes or modifications are made on all applicable design plans and specifications to ensure that construction activities would not conflict with the airport height limitations.

Impact Significance after Mitigation: Less than Significant.

Impact 4.7.4: Construction activities within the AIA for Byron Airport could cause potential temporary flight hazards through the creation of glare or distracting lights; the generation of dust or smoke, which could impair pilot visibility; or could attract an increased number of birds. (Less than Significant with Mitigation)

Alternative 1

Alternative 1 has the potential to create glare or distracting lights in the vicinity of Byron Airport through the illumination of staging and equipment storage areas or work areas next to roadways, such as Vasco Road, Walnut Boulevard, and Bixler Road. ALUCP county policies prohibit land uses that would create potential hazards to flight.

Alternative 1 would include the expansion of the Los Vaqueros Reservoir, which will include excavation, soil stockpiles, sediment and erosion control, and re-vegetation measures. Similar construction activities will be associated with other project components within Alternatives 1 through 3 (i.e., excavation of tunnel portals, pipeline transfer facilities, pump station construction, etc.) ALUCP countywide policy 4.3.6 cites these opportunities as specific characteristics that should be avoided within the AIA, and airport-specific policy 6.9.3 prohibits land uses that would result in an increased attraction of birds or would create a visual or electronic hazard to flights. FAA Advisory Circular 150/5200-33A, “Hazardous Wildlife Attractants on and near Airports” also warns against the creation of open water and other wildlife attractions within 5 statute miles of airports that support piston-powered aircraft.

Soil excavation and the creation of soil stockpiles can result in the generation of dust that could obscure pilot views during construction. The stabilization of excavated areas and soil stockpiles through the use of standard sediment and erosion control seed mixtures can also reduce the generation of dust, but such mixtures frequently include grains and other constituents that can serve as food sources for birds and other potentially hazardous wildlife. In addition, the creation of temporary sediment and erosion control ponds or other temporary open water facilities can attract avian wildlife by providing areas for nesting and loafing.

In summary, Alternative 1 would result in construction activities within the AIA for Byron Airport that could cause temporary flight hazards. This would be a significant impact.

Alternative 2

The facilities under Alternative 2 would be the same as described for Alternative 1. Impacts related to construction activities that could cause temporary flight hazards for Byron Airport under Alternative 2 would be the same as described for Alternative 1. Alternative 2 would have significant impacts.

Alternative 3

Alternative 3 would implement facilities similar to those of Alternative 1, except that Alternative 3 would not construct the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline but would expand the existing Old River Intake and Pump Station within that structure's existing footprint. Alternative 3 pipeline, power supply, and other construction would occur in or near Byron Airport Land Use Compatibility Zones. Alternative 3 would have significant impacts related to construction activities that could cause temporary flight hazards for Byron Airport.

Alternative 4

Alternative 4 would include a reduced Reservoir Expansion to 160 TAF; although there would be no construction within the Byron Airport Land Use Compatibility Zones, Alternative 4 construction lighting, soil excavation, and activities that would attract avian wildlife (such as the revegetation seed mix for the 160 TAF borrow area), could result in flight-related hazards. Alternative 4 would have significant impacts related to construction activities that could cause temporary flight hazards for Byron Airport.

Mitigation Measures

> **Measure 4.7.4a:** During project design, CCWD shall consult with Contra Costa County Airport staff regarding the location of illuminated equipment staging, storage, and construction areas, and the need to provide a potential Notice to Airmen (NOTAM) during construction activities. CCWD shall instruct its engineer to make appropriate notations on construction drawings and specifications to indicate that illuminated work areas shall incorporate the use of downward facing lights with amber lumens to prevent confusion to pilots.
>
> **Measure 4.7.4b:** During project design, CCWD shall instruct its engineer to prohibit the use of temporary sediment ponds that could create open water to attract potentially hazardous

wildlife. To ensure that an appropriate seed mixture is used during construction, CCWD shall instruct its engineer to make appropriate notations on construction drawings and specifications to indicate that all seed mixtures used for revegetation or for sediment and erosion control purposes should not contain rice, barely, millet, rye, or other potential food sources for avian wildlife.

Measure 4.10.1: During construction, CCWD will require the construction contractor to implement the Bay Area Air Quality Management District's (BAAQMD's) basic and enhanced dust control procedures (see Section 4.10, Air Quality).

Impact Significance after Mitigation: Less than Significant.

Impact 4.7.5: The proposed project and alternatives would not contribute to cumulative land use impacts. (No Impact)

Impacts involving land use plans or policies would not combine to result in cumulative impacts. The determination of significance for impacts related to these issues is whether a project would conflict with any applicable land use plan or policy adopted for the purpose of reducing or avoiding environmental impacts. Such a conflict is site specific and would be addressed on a project-by-project basis. As described above, implementing the proposed alternatives would not conflict with any land use plan, including any airport land use plan and policies, adopted for the purpose of avoiding or mitigating a significant environmental effect. Similarly, construction siting, or operation of any of the proposed project facilities under any of the project alternatives would not physically divide a community. Thus, the project would not contribute to any significant cumulative land use impacts.

Mitigation: None required.

4.8 Agriculture

This section addresses issues related to agricultural resources that may be affected by the Los Vaqueros Reservoir Expansion Project. This section begins with a discussion of the regulatory setting established by applicable federal, state, local, and regional plans and programs. The Environmental Setting subsection describes the local agricultural activities and state farmland designations for lands in the project area. The subsection on Environmental Consequences discusses the impacts attributable to the project alternatives, defines the criteria used in determining impact significance, and, where necessary, discusses feasible mitigation measures. Economic effects of changes in agricultural crop production are discussed in Section 4.17, Socioeconomic Effects.

4.8.1 Affected Environment

Regulatory Setting

Federal

Farmland Protection Policy Act

Congress passed the Farmland Protection Policy Act (FPPA) in 1981 as part of the Farm Bill. Its purpose is to minimize unnecessary conversion of farmland to nonagricultural uses as a part of federal programs. The Farmland Protection Policy Act established the Farmland Protection Program (FPP) and a Land Evaluation and Site Assessment system (LESA).[1] The Natural Resources Conservation Service administers the FPP, which is a voluntary program that provides funds to help purchase development rights to keep productive farmland in agricultural use. The program provides matching funds to state, local, and tribal government entities, and nongovernmental organizations with existing farmland protection programs to purchase conservation easements. Participating landowners agree not to convert the land to nonagricultural uses and to retain all property rights for future agriculture. A minimum 30-year term is required for conservation easements, and priority is given to applications with perpetual easements. The Natural Resources Conservation Service provides up to 50 percent of the fair market value of the easement (NRCS, 2008).

The federal LESA system is a tool used to rank lands for suitability and inclusion in the FPP. The federal LESA uses a Farmland Conversion Impact Rating (FCIR) form (Form AD-1006) to establish an FCIR score. The system evaluates several factors, including soil potential for agriculture, location, market access, and adjacent land use. These factors are used to rank land parcels for inclusion in the FPP based on local resource evaluation and site considerations (NRCS, 2008). The FCIR form can also be used to assess a project’s impact to agricultural lands, and was used in this impact analysis.

1 The federal Land Evaluation and Site Assessment system uses the same acronym, LESA, as is used by the California Department of Conservation farmland evaluation and site assessment program.

State

California Important Farmland Inventory System and Farmland Mapping and Monitoring Program

The California Department of Conservation, Division of Land Resource Protection, maintains the Farmland Mapping and Monitoring Program (FMMP) and monitors the conversion of farmland to and from agricultural use through its Important Farmland Inventory System. Farmlands are divided into the following categories based on their suitability for agriculture:

- **Prime Farmland.** This land has the best combination of physical and chemical characteristics for crop production. When treated and managed, its soil quality, growing season, and irrigation supply produce sustained high crop yields.
- **Unique Farmland.** This land does not meet the criteria for Prime Farmland or Farmland of Statewide Importance, but has produced specific crops with high economic value.
- **Farmland of Statewide Importance.** This is land other than Prime Farmland that has a good combination of physical and chemical characteristics, including irrigation, for crop production.
- **Farmland of Local Importance.** This land is either currently producing crops or has the capability to produce, but does not meet the criteria of the categories above.
- **Grazing Land.** This is land whose vegetation is suitable for grazing livestock.
- **Other Lands.** This land does not meet the criteria of any of the other categories.

Additional categories used in the FMMP mapping system are “urban and built-up lands,” and “lands committed to nonagricultural use.” The mapping system uses a minimum mapping unit size of 10 acres.

FMMP classifications are based on soil quality and irrigation status (FMMP, 2007). They differ from general plan designations and zoning because they are used to evaluate the type and amount of farmlands, rather than to designate land-use type or place restrictions on development or use. Instead, the FMMP uses these designations as part of its neutral reporting program that classifies land based on its suitability for agriculture. The FMMP also produces a biannual report on the amount of land converted from agricultural to nonagricultural use.

Williamson Act

Under the provisions of the Williamson Act (California Land Conservation Act 1965, Section 51200), local governments are empowered to establish “agricultural preserves” consisting of lands devoted to agricultural uses and other compatible uses. After establishing these preserves, the public agency, generally a county, may offer to owners of included agricultural land the opportunity to enter into annually renewable contracts that restrict the land to agricultural use for at least 10 years. In return for maintaining agricultural or open-space use of their lands, landowners receive reduced property tax assessments. The contract is self-renewing and the landowner may notify the county at any time of intent to withdraw the land from its preserve status. Withdrawal involves a 10-year period of tax adjustment to full market value before protected open space can be converted to urban uses. Williamson Act contracts can be cancelled earlier than the 10-year period upon approval of the appropriate local jurisdiction, which must make findings that cancellation is in the public interest or is consistent with the purposes of the California Land Conservation Act. Generally, the landowner must also pay a fee equal to 12½ percent of the property value.

Contra Costa County's Land Conservation Program Questions and Answers booklet (Contra Costa County, 2003) provides the following information about the use of contracted farmlands for land acquisition by a public agency:

> When any action in eminent domain for the condemnation of the fee title of an entire parcel of land subject to an agreement is filed, or when land is acquired in lieu of eminent domain for a public improvement by a public agency, the contract shall be deemed null and void as the land actually being condemned or acquired. If the action for condemnation or acquisition is abandoned by the public agency, the restrictions on the land and the agreement will be reinstated.

Therefore, any Williamson Act lands acquired for the Los Vaqueros Reservoir Expansion project would make the applicable Williamson Act contract(s) null and void.

The location of Williamson Act lands within the proposed project area that may be affected by the project is described under Impact 4.8.3.

Delta Management Plan

The Delta Protection Act of 1992 established the Delta Protection Commission, a state entity created to plan for and guide the conservation and enhancement of the Delta's natural resources while also sustaining agriculture and meeting increased recreational demand (California Public Resources Code, Sections 29700 et seq.). The Delta Protection Act defines a Primary Zone, which comprises the principal jurisdiction of the Delta Protection Commission. No project facilities are proposed to be sited within the Primary Zone (Delta Protection Commission, 1995).

The Secondary Zone is the area outside the Primary Zone and within the "Legal Delta." The Secondary Zone is not within the planning area of the Delta Protection Commission, but the commission may comment on development projects within this area. A number of proposed project components, including the New Delta Intake and Pump Station, and portions of the Delta-Transfer Pipeline, are within the Secondary Zone of the Delta Management Plan. Section 4.7, Land Use, of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) provides a more comprehensive discussion of the Delta Management Plan; the plan is not discussed further in this section.

Local

Contra Costa County General Plan

The Contra Costa County General Plan identifies goals, policies, and implementation measures related to the preservation of agricultural uses (Contra Costa County, 2005a). These goals and policies include protection and enhancement of the agricultural economy (Goal 8-6), conservation of prime productive agricultural lands (Goal 8-H), and protection and enhancement of agricultural operations to retain designated areas in agricultural use (Policy 8-38) (Contra Costa County, 2005a). See Appendix E-2 for the text of these goals and policies relevant to agricultural resources.

Alameda East County Area Plan

The Alameda East County Area Plan is a segment of the countywide general plan and presents Alameda County's policies for future development and resource conservation within East Alameda County. The Alameda East County Area Plan identifies the portion of the proposed project within Alameda County (portions of the Transfer-Bethany Pipeline) as large-parcel agriculture. This area is outside of the Urban Growth Boundary and is also designated as a wind resource area. Policies related to agricultural resources address the following relevant issues:

- Conserving prime soils and Farmland of Statewide Importance and Unique Farmland outside of the Urban Growth Boundary (Policy 71)
- Buffering between agricultural use areas and nonagricultural areas (Policy 73)
- Enforcing the Alameda County Right-to-Farm Ordinance on all lands within and next to agricultural areas (Policy 75)
- Ensuring that development next to Alameda County agricultural land mitigates impacts on agricultural land (Policy 76) (Alameda County, 2002)

See Appendix E-1 for a description of specific goals and policies related to agricultural resources.

Right-to-Farm Ordinances

Both Contra Costa County (Contra Costa County Code, Title 8, Chapter 820-2) and Alameda County (Alameda County, Code Chapter 6.28) have established "Right-to-Farm" ordinances designed to protect and promote agricultural activities, especially at the urban/agriculture interface. For the most part, a Right-to-Farm ordinance is designed to protect farmland by requiring disclosure to purchasers and users of property next to or near agricultural operations of the inherent potential problems associated with living near actively farmed land. Such concerns include, but are not limited to, the noise, odors, dust, chemicals, smoke, and hours of operation that may accompany agricultural operations. It is intended through such mandatory disclosures that purchasers and users will better understand the impact of living near agricultural operations and be prepared to accept the naturally resulting attendant conditions.

While implementation of the project alternatives would place nonagricultural (i.e., public utility) uses in and near lands designated for agricultural use, the Right-to-Farm ordinance with its mandatory disclosures and deed restrictions is not considered applicable for purchase of land for proposed water utility structures, pipelines, and power supply facilities. This is because any lands the Contra Costa Water District acquires for the project would not involve persons residing on or near agricultural land; therefore Right-to-Farm ordinances will not be discussed further in this section.

Environmental Setting

The majority of the eastern portion of Contra Costa and Alameda Counties consists of lands designated for open space, agricultural uses, and related activities such as feed mills, dairies, and farm residences. Most of the designated agricultural area is used for grazing rather than for growing crops. Livestock grazing activities are found on upland areas where the topography is relatively steep and local surface or groundwater supplies are limited. Irrigated farming, used for orchards and field crops, occurs on properties to the north and east of Los Vaqueros Reservoir, on low-lying southeast Contra Costa County lands of the Delta.

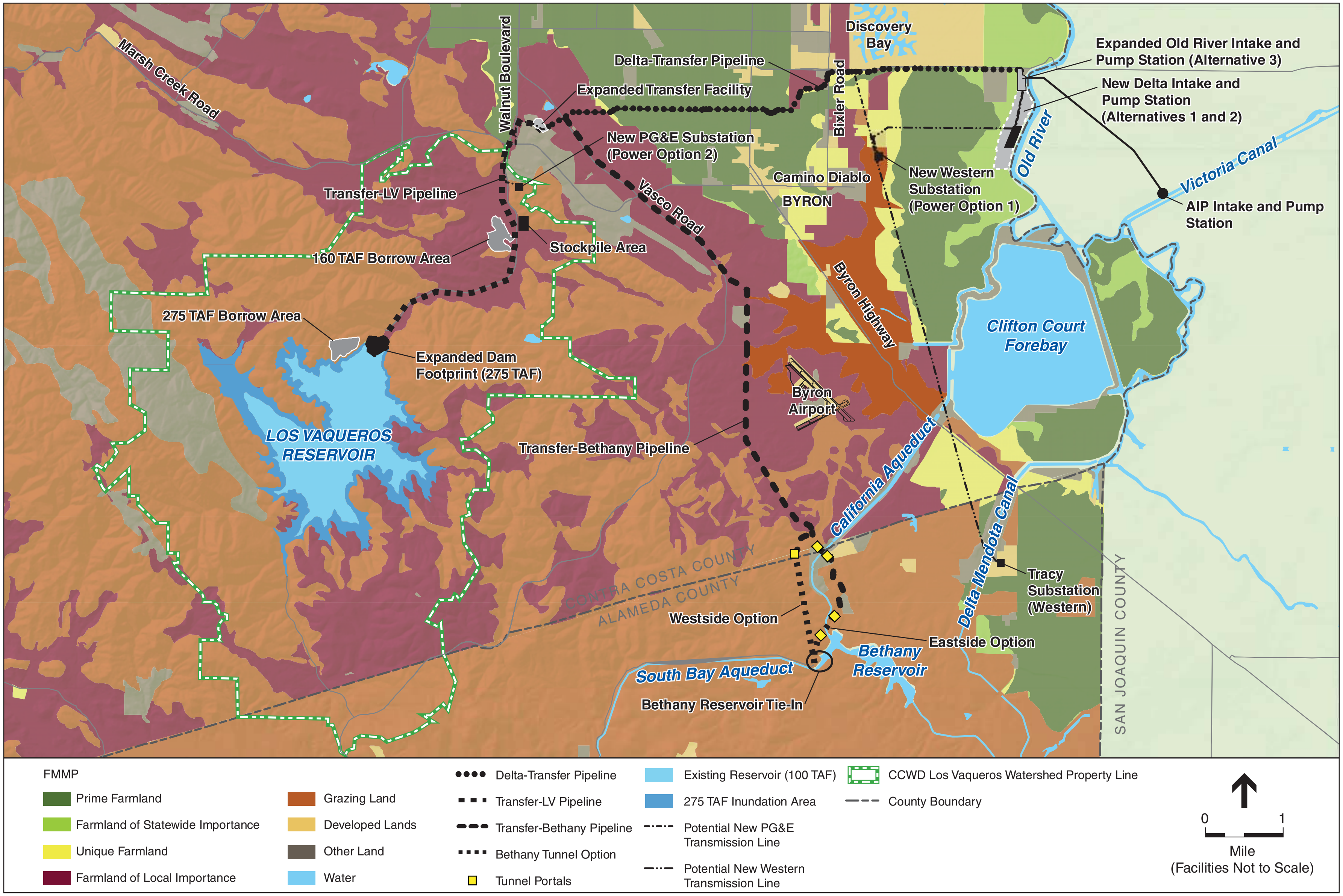
Important Farmland in the Project Area

Figure 4.8-1 shows FMMP classifications for land in the project vicinity. **Figure 4.8-2** shows those lands under Williamson Act contract in the project area. The following is a review by project facility of the designated FMMP farmlands that occur on or near proposed project sites. Also indicated are lands under Williamson Act contract; a more complete discussion of Williamson Act lands is found under Impact 4.8.3. Further information on each project facility, including the type and number of acres of agricultural land affected, are more fully described in subsection 4.8.2, Environmental Consequences, below.

Reservoir Expansion. The CCWD watershed property includes land designated under the FMMP as Farmland of Local Importance, Grazing Land, or Other Lands. No CCWD properties fall under Williamson Act contract, and the reservoir expansion does not affect any contracted lands. Although much of the CCWD watershed property is used for grazing, the purpose of the grazing is for habitat management. As mitigation for construction of the existing Los Vaqueros Reservoir, the CCWD watershed lands are managed for kit fox habitat as defined by the Biological Opinion (BO) for the existing reservoir. Land management activities include grazing cattle and sheep on large portions of CCWD property (about 10,000 acres) to provide 800 to 1,200 pounds of forage per acre as specified by the BO.

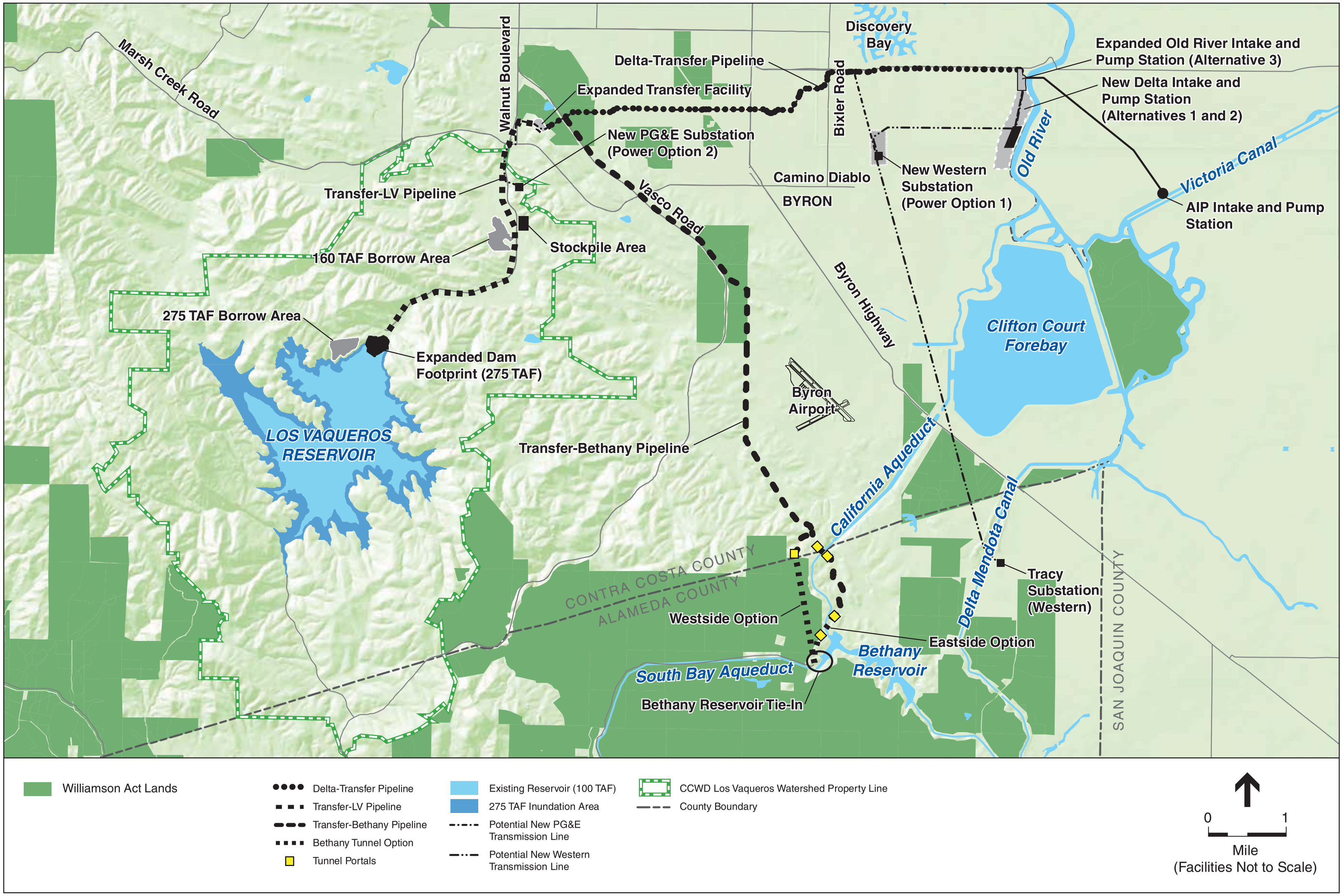
Intake Facilities. The new Delta Intake and Pump Station would be sited on land designated Farmland of Statewide Importance. The existing Old River Intake and Pump Station is also on land designated Farmland of Statewide Importance, however, no property beyond the existing facility boundaries is proposed for use. None of the properties to be affected by construction of new or expansion of existing intake facilities are under Williamson Act contract.

Conveyance Facilities. The eastern portion of the Delta-Transfer Pipeline extends through areas of Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. The western portion of the Delta-Transfer Pipeline and the Transfer-LV Pipeline would occur primarily on Grazing Land and Farmland of Local Importance. The Transfer Facility expansion would occur on land designated as Farmland of Local Importance. The Transfer-Bethany Pipeline would primarily pass through lands designated Farmland of Local Importance and, to a lesser degree, Grazing Land. The project components that are near or pass through land subject to Williamson Act contracts include portions of all three water-conveyance pipelines (Delta-Transfer Pipeline, Transfer-LV Pipeline, Transfer-Bethany Pipeline (Westside and Eastside Options) and the expanded Transfer Facility property.



SOURCE: USGS, 1993 (base map); California Department of Conservation, FMMP, 2001; and ESA, 2008

Figure 4.8-1
Important Farmlands



SOURCE: USGS, 1993 (base map); and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.8-2
Williamson Act Contract Lands

Power Supply Facilities. Under Power Option 1 (Western Only), the proposed Western Area Power Administration (Western) substation and its access road would occur on lands designated as Unique Farmland and/or Grazing Land. The power supply would be increased by using an existing 230 kilovolt (kV) transmission line that traverses from Western's Tracy Substation to a new substation site. From the new substation site, lines would be upgraded and connect with one or both intakes near Old River, passing through lands designated as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. To the west, near the existing Transfer Station, existing and proposed transmission lines would pass through lands designated as Prime Farmland, Farmland of Local Importance, and Other Lands.

Under Power Option 2 (Western & Pacific Gas and Electric Company [PG&E]), the proposed PG&E substation and its access road would occur on lands designated as Grazing Land. Proposed transmission lines would connect with one or both intakes along Old River, passing through lands designated as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland as well as Grazing Land, Farmland of Local Importance, and Other Lands. To the west, near the existing Transfer Station, existing and proposed transmission lines would pass through lands designated as Prime Farmland, Farmland of Local Importance, and Other Lands.

Recreation Facilities. Within the CCWD watershed property, areas planned for the Marina Complex, Interpretive Center, Trails/Access, and Other Facilities are all designated as Farmland of Local Importance, Grazing Land, or Other Lands. No CCWD properties fall under Williamson Act contract, and the proposed recreation facilities would not affect any contracted lands.

Farmland Conversion

Table 4.8-1 and **Table 4.8-2** provide a summary of recent changes to agricultural land within Contra Costa and Alameda Counties, respectively. Both counties experienced a net loss of agricultural land between 2004 and 2006. In both Contra Costa and Alameda Counties, the most significant net losses were in Prime Farmland.

TABLE 4.8-1
RECENT FARMLAND CONVERSIONS IN CONTRA COSTA COUNTY

	Total Acres Inventoried		2004–2006 Acreage Changes		
Land Use Category	**2004**	**2006**	**Acres Lost**	**Acres Gained**	**Net Loss**
Prime Farmland	32,024	29,938	2,523	437	2,086
Farmland of Statewide Importance	8,547	8,092	1,063	608	455
Unique Farmland	3,929	3,589	716	376	340
Farmland of Local Importance	52,257	52,071	2,083	1,897	186
Grazing Land	168,783	168,662	357	236	121
Agricultural Land Subtotal	**265,540**	**262,352**	**6,742**	**3,554**	**3,188**

SOURCE: California Department of Conservation, Division of Land Resource Protection, 2008 (Table A-4).

TABLE 4.8-2
RECENT FARMLAND CONVERSIONS IN ALAMEDA COUNTY

Land Use Category	Total Acres Inventoried		2004–2006 Acreage Changes		
	2004	2006	Acres Lost	Acres Gained	Net Loss
Prime Farmland	5,383	4,725	666	8	658
Farmland of Statewide Importance	1,505	1,391	122	8	114
Unique Farmland	2,377	2,323	179	125	54
Farmland of Local Importance[a]	N/A	N/A	N/A	N/A	N/A
Grazing Land	244,975	244,947	760	732	28
Agricultural Land Subtotal	**254,240**	**253,386**	**1,727**	**873**	**854**

[a] Under the Farmland Mapping and Monitoring Program, each county may designate certain lands as Farmland of Local Importance. Alameda County does not provide for this designation.

SOURCE: California Department of Conservation, Division of Land Resource Protection, 2008 (Table A-1).

4.8.2 Environmental Consequences

Methodology

Important Farmlands, defined as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland, are identified using data from the California Department of Conservation FMMP. Farmland of Local Importance, Grazing Land, and Other Lands are also mapped to provide agricultural land-use context and disclosure. The project alternatives are analyzed for their potential to temporarily impact Important Farmland during construction, or to permanently convert Important Farmlands to nonagricultural uses. Potential conflicts with agricultural zoning designations, potential incompatibility with a Williamson Act contract, or other changes resulting from project implementation that would remove Important Farmlands from agricultural production are also discussed. Section 4.17, Socioeconomic Effects, addresses the economic effects of permanently and temporarily converting Important Farmland to nonagricultural use and of temporarily disrupting farming activities at the proposed facility sites.

Significance Criteria

The significance criteria used in this analysis has been developed from criteria presented in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. These criteria also encompass factors taken into account under the National Environmental Policy Act (NEPA) to determine the significance of an action in terms of its context and the intensity of its effects. The project alternatives would result in a significant impact on agricultural resources if they result in any of the following:

- Permanently convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Important Farmland, collectively) to nonagricultural use, as shown on the maps prepared pursuant to the FMMP of the California Resources Agency

- Conflict with existing zoning for agricultural use or a Williamson Act contract

- Involve other changes in the environment that, because of their location or nature, could individually or cumulatively result in the conversion of Important Farmland to nonagricultural uses

Impact Summary

Table 4.8-3 provides a summary of the impact analysis for issues related to agricultural lands and activities.

TABLE 4.8-3
SUMMARY OF IMPACTS – AGRICULTURE

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.8.1: Project construction would temporarily impact the agricultural use of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance.	LSM	LSM	LSM	LS
4.8.2: The project would permanently convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to nonagricultural use.	SU	SU	LSM	LS
4.8.3: The project would not conflict with zoning for agricultural use or a Williamson Act contract.	LS	LS	LS	NI
4.8.4: The project would involve changes in the environment that, due to their location or nature, could contribute to cumulative impacts from conversion of Important Farmland to nonagricultural uses.	SU	SU	LSM	LS

NOTES:

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed, and no changes in CCWD facilities or operations would occur that would directly or indirectly convert Important Farmland to nonagricultural use or otherwise affect the continued use of agricultural lands for agricultural production. Therefore, this alternative would have no impact on agriculture.

Impact 4.8.1: Project construction would temporarily impact the agricultural use of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. (Less than Significant with Mitigation for Alternatives 1, 2, and 3; Less than Significant for Alternative 4)

Overview – All Alternatives

Project construction activities would cause short-term disturbance of agricultural lands during all or part of the approximately 3-year project-construction period. Construction activities could cause direct disturbance to agricultural lands or indirectly disrupt agricultural lands and activities through disruption of irrigation systems, soil compaction affecting drainage, dewatering, and dust generation.

Construction dewatering of the pipeline trench could also affect agricultural drainage in fields next to the pipeline construction. Dewatering operations would be designed to maximize dewatering in the immediate area of the trench and minimize the amount of “drawdown” in areas outside the trench. Drawdown inside and outside the trench construction area would be temporary; the affected land could be returned to agricultural use after construction has ended.

In addition to the temporary direct disturbance of land, construction activities could indirectly affect agricultural operations on adjacent lands. Temporary impacts to farming activities may extend slightly beyond the easement to provide temporary farming access roads, temporary relocation of irrigation and drainage ditches, and/or turn rows for equipment maneuvering. Construction across agriculture fields for pipeline and power supply construction could also isolate areas and render them too small to effectively or economically farm during construction.

The farmland acreages that would be disturbed during construction are listed by project component in **Table 4.8-4** and by project alternative in **Table 4.8-5**. Because two electrical supply options (Power Options 1 and 2) exist for power facility constructions and two possible southern end alignments are possible for the Transfer-Bethany Pipeline (Westside and Eastside Options), Table 4.8-5 shows the land acreage affected for each major project component, and lists impacts associated with the alternative alignments and the power supply options. Therefore, a total number of affected acres for each alternative must be determined by adding the selected alignment and the selected power option, rather than by totaling all components in a column. As is discussed in Impact 4.8.2, short-term construction will not create any permanent loss of agricultural land in the estimated acreages because of the facility siting.

Alternative 1

Under Alternative 1, construction activities would temporarily affect land that is currently under cultivation or used as grazing land during all or part of the estimated 3-year construction period. As described above, construction would interfere with agriculture in both direct and indirect ways.

Los Vaqueros Reservoir and Dam Modifications

During construction of the Los Vaqueros Reservoir Expansion, raising the dam and constructing Appurtenant Facilities would have no temporary effect on Important Farmland or Other Farmlands.

Delta Intake Facilities

Construction of the new Delta Intake and Pump Station would temporarily affect up to 22.5 acres of Farmland of Statewide Importance. This temporary impact area would include the pipeline and power transmission line alignment to connect the new Delta Intake with the existing Old River Intake and Pump Station. Within the affected area, agricultural activities would be discontinued temporarily for about 12 months. This temporarily affected area does not include the permanent loss of agricultural acreage that would occur at the new Delta Intake and Pump Station Facility site (discussed in Impact 4.8.2).

TABLE 4.8-4
TEMPORARY IMPACTS ON FARMLAND RESOURCES BY PROPOSED PROJECT COMPONENTS

	IMPORTANT FARMLAND (in acres)				OTHER FARMLAND (in acres)			
	Prime Farmland	**Unique Farmland**	**Farmland of Statewide Importance**	***SUBTOTAL: IMPORTANT FARMLAND***	**Farmland of Local Importance**	**Grazing Land**	**Other Lands**	**TOTAL FARMLAND**
Los Vaqueros Reservoir Expansion/Dam Modification								
Dam Raise and Inundation - 275 TAF (Alts 1, 2, and 3)	0	0	0	***0***	0	0	0	**0**
Dam Raise and Inundation -160 TAF (Alt 4)	0	0	0	***0***	0	0	0	**0**
Delta Intake Facilities								
New Delta Intake and Pump Station (Alts 1 and 2)	0	0	22.5	***22.5***	0	0	1.5	**24**
Old River Intake and Pump Station Expansion (Alt 3)	0	0	0	***0***	0	0	0	**0**
Conveyance Facilities								
Delta-Transfer Pipeline (Alts 1, 2, and 3)	75.5	20	14	***109.5***	36	0	10	**155.5**
Transfer Facility Expansion (Alts 1, 2, and 3)	0	0	0	***0***	0	0	8	**8**
Transfer-LV Pipeline (Alts 1, 2, and 3)	0	0	0	***0***	70.5	0.5	8	**79.00**
Transfer –Bethany Pipeline Main (Alts 1 and 2)	0	0	0	***0***	209	16	6	**231**
Westside Option (Alts 1 and 2)	0	0	0	***0***	0.5	18	0	**18.5**
Eastside Option (Alts 1 and 2)	0	0	0	***0***	0.5	33	12	**45.5**
Spoils Disposal - 275 TAF	0	0	0	***0***	7.5	3	0	**10.5**
Stockpile Area	0	0	0	***0***	6.5	8.5	0	**15**
Power Supply								
Power Option 1: Western Only (Alts 1, 2 and 3)	15	19	5	***39***	4	15.5	3	**61.5**
Power Option 2: Western & PG&E (Alts 1, 2 and 3)	0	0	0	***0***	12	8	2.5	**22.5**
Recreation Facilities								
Marina Complex (Alts 1, 2 and 3)	0	0	0	***0***	0	0	0	**0**
Marina (Relocation - Alt 4)	0	0	0	***0***	0	0	0	**0**
Hiking Trails/Access (Alts 1, 2 and 3)	0	0	0	***0***	4	21.5	0.5	**26**
Hiking Trails/Access (Alt 4)	0	0	0	***0***	5.0	18.5	0	**23.5**
Other Facilities - Piers, Picnic Areas, Restrooms, Parking (Alts 1, 2 and 3)	0	0	0	***0***	0	1	0	**1**
Other Facilities - Piers, Picnic Areas, Restrooms, Parking (Alt 4)	0	0	0	***0***	0	1	0	**1**

NOTE: Important Farmland is composed of Prime Farmland, Unique Farmland and Farmland of Statewide Importance

Alt = Alternative   PG&E = Pacific Gas and Electric Company   TAF = thousand acre-feet   Western = Western Area Power Administration

TABLE 4.8-5
TEMPORARY IMPACTS ON FARMLAND RESOURCES BY PROPOSED PROJECT ALTERNATIVES

	IMPORTANT FARMLAND* (in acres)				OTHER FARMLAND (in Acres)			
	Prime Farmland	**Unique Farmland**	**Farmland of Statewide Importance**	***SUBTOTAL: IMPORTANT FARMLAND***	**Farmland of Local Importance**	**Grazing Land**	**Other Lands**	**TOTAL FARMLAND**
Alternative 1 - 275 TAF								
Dam Raise and Inundation	0	0	0	***0***	0	0	0	**0**
New Delta Intake and Pump Station	0	0	22	***22***	0	0	1.5	**23.5**
Conveyance	76	20	14	***110***	330	28.5	32	**500.5**
Westside Option	0	0	0	***0***	0.5	18	0	**18.5**
Eastside Option	0	0	0	***0***	0.5	33	12	**45.5**
Power Option 1: Western Only	15	19	5	***39***	4	15	3	**61**
Power Option 2: Western & PG&E	0	0	0	***0***	12	8	2.5	**22.5**
Recreation Facilities	0	0	0	***0***	4	22.5	0.5	**27**
Alternative 2 - 275 TAF								
Dam Raise and Inundation	0	0	0	***0***	0	0	0	**0**
New Delta Intake and Pump Station	0	0	22	***22***	0	0	1.5	**23.5**
Conveyance	76	20	14	***110***	330	28.5	32	**500.5**
Westside Option	0	0	0	***0***	0.5	18	0	**18.5**
Eastside Option	0	0	0	***0***	0.5	33	12	**45.5**
Power Option 1: Western Only	15	19	5	***39***	4	15	3	**61**
Power Option 2: Western & PG&E	0	0	0	***0***	12	8	2.5	**22.5**
Recreation Facilities	0	0	0	***0***	4	22.5	0.5	**27**
Alternative 3 - 275 TAF								
Dam Raise and Inundation	0	0	0	***0***	0	0	0	**0**
Old River Intake and Pump Station Expansion	0	0	0	***0***	0	0	0	**0**
Conveyance	76	20	14	***110***	113.5	9	26	**258.5**
Power Option 1: Western Only	15	19	5	***39***	4	15	3	**61**
Power Option 2: Western & PG&E	0	0	0	***0***	12	8	2.5	**22.5**
Recreation Facilities	0	0	0	***0***	4	22.5	0.5	**7**
Alternative 4 - 160 TAF								
Dam Raise and Inundation	0	0	0	***0***	0	0	0	**0**
Recreation Facilities	0	0	0	***0***	5	19.5	0	**24.5**

NOTE: Acres are approximate; will be calculated based on final design

PG&E = Pacific Gas and Electric Company TAF = thousand acre-feet Western = Western Area Power Administration

* Important Farmland is composed of Prime Farmland, Unique Farmland and Farmland of Statewide Importance

Conveyance Facilities

A construction easement up to 200 feet wide has been evaluated for the Delta-Transfer Pipeline and the Transfer-LV Pipeline. A construction easement 300 feet wide is evaluated for the Transfer-Bethany Pipeline (see Figure 3-22). Although not of all the construction easement for each pipeline would occur within active farmland, the impact to agricultural acreage is calculated on the full width of the construction easement in order to provide a conservative impact analysis. The assumption being made is that pipeline construction could affect agricultural lands for 6 to 12 months depending on the nature of the construction and timing of site restoration.

Delta-Transfer Pipeline. Construction of this pipeline within a 200-foot wide construction easement would cause short-term disruption of up to 76 acres of Prime Farmland, 20 acres of Unique Farmland, and 14 acres of Farmland of Statewide Importance, totaling about 110 acres of Important Farmland. About 46 acres of temporarily affected Other Farmland include 36 acres of Farmland of Local Importance and 10 acres of Other Lands.

Transfer Facility Expansion. Construction of the Transfer Facility Expansion would not affect any Important Farmlands but would temporarily affect about 8 acres of Other Lands. This area could be disturbed for up to 3 years since both the Delta-Transfer Pipeline and Transfer-LV Pipeline would tie into this facility.

Transfer-LV Pipeline. Construction of the Transfer–LV Pipeline would not affect any Important Farmlands but would result in short-term impacts to about 71 acres of Farmland of Local Importance, less than 1 acre of Grazing Land, and 8 acres of Other Lands, totaling about 80 acres of Other Farmland.

Transfer-Bethany Pipeline. Construction of the Transfer–Bethany Pipeline, within a construction easement measuring up to 300 feet wide, up to the junction with the two southern alignment options, would not affect any Important Farmlands but would result in impacts to 209 acres of Farmland of Local Importance, 16 acres of Grazing Land, and 6 acres of Other Lands, totaling about 231 acres of Other Farmland.

Construction of the Westside Option would not affect any Important Farmlands but would result in temporary impacts to less than 1 acre of Farmland of Local Importance, and about 18 acres of Grazing Land. The tunnel segment would minimize ground disturbance and impact to farmland through this area. Construction of the Eastside Option would not affect any Important Farmland but would temporarily affect less than 1 acre of Farmland of Local Importance, about 33 acres of Grazing Lands, and 12 acres of Other Lands. Two short stretches of tunnel would minimize ground disturbance through this area.

Power Supply

All the proposed power transmission lines would be constructed or upgraded along existing utility alignments. Pole installation and stringing overhead lines would have temporary construction impacts on these lands as power poles are upgraded or replaced, and new transmission lines strung. The work areas would extend an estimated 25 feet on both sides of the new power lines for 3 to 6 months.

Power Option 1 (Western Only). Construction of a new Western substation and transmission lines would temporarily affect about 15 acres of Prime Farmland, 19 acres of Unique Farmland, and 5 acres of Farmland of Statewide Importance, totaling about 39 acres of Important Farmland. About 23 acres of temporarily affected Other Farmland includes 4 acres of Farmland of Local Importance, 16 acres of Grazing Land and 3 acres of Other Lands.

Power Option 2 (Western & PG&E). Under this option, construction would not affect any Important Farmlands, but construction of Power Option 2 including a new PG&E substation would temporarily affect 12 acres of Farmland of Local Importance, 8 acres of Grazing Lands and 3 acres of Other Lands, totaling about 23 acres of Other Farmland.

Recreation Facilities

Construction to relocate and expand the recreational facilities within the Los Vaqueros Watershed would not affect any Important Farmlands but would temporarily affect 4 acres of Farmland of Local Importance, 22 acres of Grazing Lands, and less than 1 acre of Other Lands, totaling about 27 acres of temporarily affected land. Given the extent of construction associated with the reservoir expansion, these agricultural areas would probably be disrupted for up to 3 years.

Marina Complex and Interpretive Center. These facilities would be constructed on the dam borrow area, which would permanently remove the current grazing land. Construction of this facility would result in no temporary impacts to farmland, because all impacts to grazing land would be permanent, as discussed under Impact 4.8.2.

Hiking Trails/Access. Construction of new and replacement trails, and of road access would not affect any Important Farmlands, but would temporarily affect 4 acres of Farmland of Local Importance, 22 acres of Grazing Lands, and less than 1 acre of Other Lands.

Other Recreational Facilities. Construction of replacement Fishing Piers, Picnic Areas, Restrooms, Parking, and similar recreational facilities would not affect any Important Farmlands but would temporarily affect about 1 acre of Grazing Lands, as shown in Table 4.8.4.

Summary

In summary, under Alternative 1, temporary construction would affect up to 91 acres of Prime Farmland, 39 acres of Unique Farmland, and 41 acres of Farmland of Statewide Importance for a total of 171 acres of temporarily impacted Important Farmlands. This would represent about 0.4 percent of the 41,619 acres of Important Farmlands in Contra Costa County. No Important Farmlands are within the project area in Alameda County. Temporary impacts to Important Farmland under Alternative 1 would be significant.

Alternative 2

Alternative 2 would have the same temporary construction impacts on Important Farmland as those discussed under Alternative 1. The temporary impacts to Important Farmland under Alternative 2 would be significant.

Alternative 3

Alternative 3 would result in construction activities affecting up to 327 acres of agricultural land, including 149 acres of Important Farmland. As indicated on Tables 4.8-4 and 4.8-5, Alternative 3 would not include the South Bay Connection, which includes construction of a new Delta Intake and Pump Station and the Transfer-Bethany Pipeline. As a result, Alternative 3 would avoid temporary impacts to about 22 acres of Farmland of Statewide Importance. Expansion of the existing Old River Intake and Pump Station under Alternative 3 would not affect farmland because the expansion would occur on the existing site. The total amount of Important Farmlands affected would represent about 0.3 percent of the 41,619 acres of Important Farmlands in Contra Costa County. Temporary impacts to Important Farmland under Alternative 3 would be significant.

Alternative 4

Alternative 4 would not affect any Important Farmlands but could result in short-term disruption affecting about 5 acres of Farmland of Local Importance and 19 acres of Grazing Lands. This alternative would result in less construction impact to farmlands than Alternative 1 because it involves a limited expansion of Los Vaqueros Reservoir and associated Recreation Facilities and does not include construction of a Delta intake, conveyance facilities, or power supply. Temporary impacts to agricultural lands under Alternative 4 would be less than significant because there would be no impacts to Important Farmland.

Mitigation Measures

Measure 4.8.1: To minimize temporary construction impacts to agricultural activities on Important Farmland, CCWD shall ensure that the following measures are incorporated into the project construction plans and specifications:

- Ensure that the existing drainage systems at proposed project sites needed for farming activities function as necessary to avoid disrupting agriculture
- Design dewatering operations to maximize dewatering in the immediate area of trench and to minimize drawdown area outside of trench during dewatering of construction trenches and other excavated areas; monitor soil moisture in adjacent crop fields to ensure adequate crop moisture and assist with irrigation scheduling
- Locate construction access and staging areas in areas that are fallow and use existing roads to access construction areas to the extent possible
- Coordinate construction scheduling as practicable to minimize disruption of agricultural operations by scheduling excavation before or after the growing season
- Minimize construction dust on crops by implementing Air Quality Measures 4.10.1

The above mitigation measures would reduce temporary construction impacts to less-than-significant levels.

Impact Significance after Mitigation: Less than Significant.

Impact 4.8.2: The project would permanently convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to nonagricultural use. (Less than Significant for Alternative 4; Less than Significant with Mitigation for Alternative 3; Significant and Unavoidable for Alternatives 1 or 2)

Table 4.8-6 presents the acres of farmland permanently affected by each project component. Permanent impacts from the proposed project are shown by alternative in **Table 4.8-7**. As noted in the Regulatory Setting, Important Farmlands are defined as Prime Farmland, Unique Farmland, and Farmland of Statewide Importance. Project impacts to Farmland of Local Importance, Grazing Lands, and Other Lands are not considered significant in this analysis; however, the data has been included for disclosure purposes.

Alternative 1

Under this alternative, development of the new Delta Intake and Pump Station would require the permanent conversion of 21.5 acres of Farmland of Statewide Importance.

Power Supply Option 1 also includes the potential for the Western substation to be located on Unique Farmland (a type of Important Farmland) instead of on Grazing Land. As a result of the flexibility in facilities siting, the Western substation would be sited within the study area to avoid and minimize impacts to Important Farmland. The expectation is that the Unique Farmland area would be avoided by project design. Although no impacts to Important Farmland are expected, Mitigation Measure 4.8.2b will be implemented to ensure that final siting plans consider, and minimize and avoid, any permanent impacts to Important Farmland.

Project construction activities, though temporary, could also result in the impairment of agricultural land that could contribute to permanent long-term loss of agricultural acreage for cultivation if protective measures are not taken. Pipeline construction through cultivated agricultural areas could result in adverse effects, such as soil compaction, changes in groundwater or surface hydrology and drainage, and soil profile alteration.

The conveyance pipelines would primarily be constructed using a conventional trench design. The pipeline would be buried in a trench excavated to maintain a minimum 5-foot cover over the pipe. This depth was decided based upon CCWD's recent experience with pipelines through agricultural areas for the Alternative Intake Project (AIP). For that project, geotechnical investigations indicated that the soils in lower elevation parts of the Delta are a mix of loosely consolidated sands, silts, and clays, and are predominantly mineral soil type. With soils of these characteristics, the current practice of managing water level below the root zone via subsurface drainage could continue to be implemented with a minimum of 5 feet of cover over the pipeline.

Pipeline facilities would also include some appurtenances installed in buried vaults that extend aboveground (e.g., blow-off or air-release valves). Since most project pipelines would be sited in existing utility corridors and/or along existing roadways, these aboveground valves would be sited at the edge of fields, minimizing effects on agricultural operations. The eastern portion of the Delta-Transfer Pipeline (proposed to be constructed in an existing utility corridor along existing roadways) extends through areas of Important Farmland. However, valves not located along the edge of roads would not be located on Important Farmland.

TABLE 4.8-6
PERMANENT IMPACTS ON FARMLAND RESOURCES BY PROPOSED PROJECT COMPONENTS

	IMPORTANT FARMLAND (in Acres)				OTHER FARMLAND (in Acres)			
	Prime Farmland	Unique Farmland	Farmland of Statewide Importance	*SUBTOTAL: IMPORTANT FARMLAND*	Farmland of Local Importance	Grazing Land	Other Lands	TOTAL FARMLAND
Los Vaqueros Reservoir Expansion/Dam Modification								
Dam Raise and Inundation - 275 TAF (Alts 1, 2, and 3)	0	0	0	***0***	552.5	444.5	0.5	**997.5**
Dam Raise and Inundation -160 TAF (Alt 4)	0	0	0	***0***	267	147	0	**414**
Borrow Areas -160 TAF (Alt 4)	0	0	0	***0***	46	22	0	**68**
Delta Intake Facilities								
New Delta Intake and Pump Station (Alts 1 and 2)	0	0	21.5	***21.5***	0	0	0	**21.5**
Old River Intake and Pump Station Expansion (Alt 3)	0	0	0	***0***	0	0	0	**0**
Conveyance Facilities								
Delta-Transfer Pipeline (Alts 1, 2, and 3)	0	0	0	***0***	0	0	0	**0**
Transfer Facility Expansion (Alts 1, 2, and 3)	0	0	0	***0***	0	0	3.5	**3.5**
Transfer-LV Pipeline (Alts 1, 2, and 3)	0	0	0	***0***	0	0	0	**0**
Transfer –Bethany Pipeline Main (Alts 1 and 2)	0	0	0	***0***	0	0	0	**0**
Westside Option (Alts 1 and 2)	0	0	0	***0***	0	0	0	**0**
Eastside Option (Alts 1 and 2)	0	0	0	***0***	0	0	0	**0**
Spoils Disposal - 275 TAF (Alts 1, 2 and 3)	0	0	0	***0***	14.5	7	0	**21.5**
Power Supply								
Power Option 1: Western Only (Alts 1, 2 and)	0	0	0	***0***	0	2	0	**2**
Power Option 2: Western & PG&E (Alts 1, 2 and 3)	0	0	0	***0***	0	2	0	**2**
Recreation Facilities								
Marina Complex (Alts 1, 2 and 3)	0	0	0	***0***	0	47.5	0	**47.5**
Marina (replacement - Alt 4)	0	0	0	***0***	0	9	0	**9**
Hiking Trails/Access (Alts 1, 2 and 3)	0	0	0	***0***	12	51.5	0.5	**64**
Hiking Trails/Access (Alt 4)	0	0	0	***0***	14.5	44	0	**58.5**
Other Facilities - Fishing Piers, Picnic Areas, Restrooms, Parking (Alts 1, 2 and 3)	0	0	0	***0***	5.5	6.5	0	**12**
Other Facilities - Fishing Piers, Picnic Areas, Restrooms, Parking (Alt 4)	0	0	0	***0***	0	1	0	**1**

NOTE: Important Farmland is composed of Prime Farmland, Unique Farmland and Farmland of Statewide Importance

Alt = Alternative PG&E = Pacific Gas and Electric Company TAF = thousand acre-feet Western = Western Area Power Administration

TABLE 4.8-7
PERMANENT IMPACTS ON FARMLAND RESOURCES BY PROPOSED PROJECT ALTERNATIVES

	IMPORTANT FARMLAND (in Acres)				OTHER FARMLAND (in Acres)			
	Prime Farmland	**Unique Farmland**	**Farmland of Statewide Importance**	***SUBTOTAL: IMPORTANT FARMLAND***	**Farmland of Local Importance**	**Grazing Land**	**Other Lands**	**TOTAL FARMLAND**
Alternative 1 - 275 TAF								
Dam Raise and Inundation	0	0	0	***0***	552.5	444.5	0.5	**997.5**
New Delta Intake and Pump Station	0	0	21.5	***21.5***	0	0	0	**21.5**
Conveyance	0	0	0	***0***	14.5	7	3.5	**25**
Power Option 1: Western Only	0	0	0	***0***	0	2.18	0	**2.18**
Power Option 2: Western & PG&E	0	0	0	***0***	0	2	0	**2**
Recreation Facilities	0	0	0	***0***	17.5	105.5	0.5	**123.5**
Alternative 2 - 275 TAF								
Dam Raise and Inundation	0	0	0	***0***	552.5	444.5	0.5	**997.5**
New Delta Intake and Pump Station	0	0	21.5	***21.5***	0	0	0	**21.5**
Conveyance	0	0	0	***0***	14.5	7	3.5	**25**
Power Option 1: Western Only	0	0	0	***0***	0	2	0	**2**
Power Option 2: Western & PG&E	0	0	0	***0***	0	2	0	**2**
Recreation Facilities	0	0	0	***0***	17.5	105.5	0.5	**123.5**
Alternative 3 - 275 TAF								
Dam Raise and Inundation	0	0	0	***0***	552.5	444.5	0.5	**997.5**
Old River Intake and Pump Station Expansion	0	0	0	***0***	0	0	0	**0**
Conveyance	0	0	0	***0***	0	0	3.5	**3.5**
Power Option 1: Western Only	0	0	0	***0***	0	2	0	**2**
Power Option 2: Western & PG&E	0	0	0	***0***	0	2	0	**2**
Recreation Facilities	0	0	0	***0***	17.5	105.5	0.5	**123.5**
Alternative 4 - 160 TAF								
Dam Raise and Inundation	0	0	0	***0***	167	147	0	**314**
160 TAF Recreation	0	0	0	***0***	14.5	54	0	**68.5**
Borrow Area (Kellogg Valley)	0	0	0	***0***	16	22	0	**38**

* Important Farmland is composed of Prime Farmland, Unique Farmland and Farmland of Statewide Importance

PG&E = Pacific Gas and Electric Company TAF = thousand acre-feet Western = Western Area Power Administration

Other important agricultural considerations related to pipeline trench excavation are soil profile and compaction. Construction methods, such as using scrapers to stockpile the top layer of soil, can be implemented to ensure minimal soil profile alteration during trench backfill. Maximum compaction is a desirable result for construction, but undesirable for areas intended for future plant growth. Excess compaction inhibits root, water, and air penetration in soil and thus plant growth. With insufficient compaction, soil may settle over time, potentially interfering with surface water flow and tractor traffic over the land. Geotechnical investigations and compaction monitoring during trench backfill are among methods that can be implemented to ensure appropriate compaction and minimize effects on the existing land use. If consideration of the agricultural concerns noted above were included in the design, the presence of the buried pipeline would not preclude farming over the pipeline alignment; therefore, no acreage of permanent agricultural land conversion is anticipated for the pipeline corridor.

Summary

In summary, Alternative 1 would result in permanent conversion of about 22 acres of Important Farmland to nonagricultural use. Alternative 1 would not result in permanent impacts on Prime Farmland or Unique Farmland, but the new Delta Intake and Pump Station would result in permanent conversion of 22 acres of Farmland of Statewide Importance, and could result in additional long-term loss of Important Farmland if protective measures are not taken during construction. This impact would be significant.

Alternative 2

Alternative 2 would have the same impacts on farmland as those discussed above for Alternative 1 because Alternative 2 would involve implementation of the same facilities. Like Alternative 1, Alternative 2 would result in permanent conversion of 22 acres of Farmland of Statewide Importance, and could result in additional long-term loss of Important Farmland if protective measures are not taken during construction. This impact would be significant.

Alternative 3

Alternative 3 would result in conversion of 1,126 acres of Other Farmland, and no acres of Important Farmland because Alternative 3 does not include construction of the new Delta Intake and Pump Station. No additional land would be converted to upgrade facilities at the Old River Intake and Pump Station. Permanent impacts from project facilities are presented in Tables 4.8-6 and 4.8-7. No permanent conversion of Important Farmland would result from Alternative 3; however, Alternative 3 could result in long-term loss of Important Farmland if protective measures are not taken during construction. Impacts on agriculture would be significant.

Alternative 4

Alternative 4 would result in conversion of 551 acres of Other Farmland, but no loss of Important Farmland. This alternative’s impacts result from expanding the reservoir to 160 TAF and replacing recreational facilities, which affects primarily Grazing Land (282 acres) and a lesser amount of Farmland of Local Importance (201 acres). There would be no impacts related to conveyance facilities or new power supply facilities because these components would not be constructed under Alternative 4. No permanent conversion of Important Farmland would result from Alternative 4 and construction would not result in long-term loss of Important Farmland; therefore, impacts on agriculture would be less than significant.

Mitigation Measures

Measure 4.8.2a: To support the continued productive use of Important Farmlands in the project area, CCWD shall ensure that the following measures are taken during project construction activities in Important Farmland:

- Replace soils over pipelines in a manner that will minimize any negative impacts on crop productivity. The surface and subsurface soil layers will be stockpiled separately and returned to their appropriate locations in the soil profile.
- Monitor pre-construction soil densities and return the surface soil (approximately the top 3 feet) to within 5 percent of original density so that over-compaction of the top layers of soil is avoided.
- Rip the top soil layers, where necessary, to achieve the appropriate soil density. Ripping may also be used in areas, such as in construction staging locations, where vehicle and equipment traffic have compacted the top soil layers.
- Minimize compaction and loss of soil structure by not working or traveling on wet soil. Before construction begins, geotechnical testing will be done to determine the moisture content limit above which work should not occur. Where working or driving on wet soil cannot be avoided, roadways will be capped with spoils that will be removed at the end of construction and/or ripped and amended with organic material as needed.
- Remove all construction-related debris from the soil surface. This will prevent rock, gravel, and construction debris from interfering with agricultural activities.
- Perform soil density monitoring during backfill and ripping to minimize excessive compaction and minimize effects on future agricultural land use.
- Remove topsoil before excavating in fields. Return topsoil to top of fields to avoid detrimental inversion of soil profiles.
- Control compaction to minimize changes to lateral groundwater flow, which could affect both irrigation and internal drainage.

Measure 4.8.2b: CCWD will provide the following mitigation for the conversion of Important Farmland:

For each acre of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance that is permanently converted to nonagricultural use, 1 acre of agricultural conservation easement will be obtained. An agricultural conservation easement is a voluntary, recorded agreement between a landowner and a holder of the easement that preserves the land for agriculture. The easement places legally enforceable restrictions on the land. The exact terms of the easement are negotiated, but restricted activities will include subdivision of the property, non-farm development, and other uses that are inconsistent with agricultural production. The mitigation lands must be of equal or better quality (according to the latest available FMMP data) and have an adequate water supply. In addition, the mitigation lands must be within the same county. Information presented in Table 4.8-6 indicates that this compensatory mitigation would require acquisition of easements on about 22 acres of Farmland of Statewide Importance, preferably within Contra Costa County.

Impact Significance after Mitigation: Significant and unavoidable. These mitigation measures would reduce the impact of the proposed conversion of Farmland of Statewide Importance to nonagricultural uses, but not to a less-than-significant level.

Impact 4.8.3: The project would not conflict with zoning for agricultural use or a Williamson Act contract. (Less than Significant for Alternatives 1, 2, and 3; No Impact for Alternative 4)

Figure 4.8-2 shows the properties in the project area that are currently under Williamson Act contracts. Proposed project components would be on or next to 9 properties under Williamson Act contract. **Table 4.8-8** lists the project facilities and number of properties with Williamson Act contracts that would be affected (Note that multiple facilities may cross the same parcel, therefore the total is greater than 9):

TABLE 4.8-8
NUMBER OF PROPERTIES WITH WILLIAMSON ACT CONTRACTS THAT WOULD BE AFFECTED

Project Component	Parcels With Williamson Act Contracts
Delta-Transfer Pipeline	1
Expanded Transfer Facility	1
Transfer-LV Pipeline	2
Transfer-Bethany Pipeline	6
Power Supply Option 1	1
Power Supply Option 2	1

Further information on potential impacts to Williamson Act lands is provided by facility, as follows:

Los Vaqueros Reservoir and Dam Modifications

Because CCWD is a special district not eligible for placing land under Williamson Act contracts and also owns all the land for the reservoir expansion, the area to be affected by the reservoir expansion or provision of recreation facilities is not under Williamson Act contract.

Delta Intake Facilities

None of the properties to be affected by constructing new, or by expanding existing intake facilities, are under Williamson Act contract.

Conveyance Facilities

The project components that are near or pass through land subject to Williamson Act contracts include portions of all three water-conveyance pipelines (Delta-Transfer Pipeline, Transfer-LV Pipeline, and Transfer-Bethany Pipeline (Westside and Eastside Options)) and the Expanded Transfer Facility property.

Delta-Transfer Pipeline. In the area east of the Expanded Transfer Facility, this pipeline would pass by one property under Williamson Act contract.

Transfer Facility Expansion. The area north of the Transfer Facility includes one property under Williamson Act contract.

Transfer-LV Pipeline. In the area south and west of the expanded Transfer Facility, this pipeline would pass by 2 properties under Williamson Act contracts.

Transfer-Bethany Pipeline. The main portion of the Transfer-Bethany Pipeline would pass by or through 6 parcels under Williamson Act contract. However, the pipeline's Westside Option would tunnel under Williamson Act land and the tunneling portals would also be outside of Williamson Act contract areas. For the Eastside Option, one tunneling portal would occur near—however, not on—contracted land. No Williamson Act lands in Alameda County would be affected by project construction.

Power Supply

A portion of a new 21 kV transmission line under Power Option 1 (Western Only) would be in an existing utility easement that passes through or next to one property that is under contract. Under Power Option 2, the upgrade of an existing PG&E 21 kV transmission line would cross one property also under Williamson Act contract.

Alternative 1

As indicated in Table 4.8-8, under Alternative 1, project facilities and pipeline alignments would be on or next to 9 properties with Williamson Act contracts. Some contracted properties are affected by more than one project component, resulting in a total greater than 9. Construction of the Delta-Transfer and Transfer-LV Pipelines would temporarily affect agricultural use of lands because these facilities would require acquisition of temporary construction easements in active or fallowed agricultural lands under Williamson Act contracts.

Construction of the Transfer-Bethany Pipeline in the project area would require both temporary construction easements (up to 300 feet wide) and long-term (up to 85 feet wide) acquisition of fee title or easement interests in the active or fallowed agricultural lands that are under Williamson Act contract. The Williamson Act anticipates such acquisitions and states that when an agency acquires all or a portion of property subject to the Williamson Act by eminent domain or threat of condemnation, the Williamson Act contract is deemed null and void as to the land or interest acquired by the agency. If only an easement is acquired, then the contract is void as to that interest.

Moreover, proposed water facility uses on Williamson Act contracted lands are considered compatible under Section 51238.1 of the Government Code that governs compatibility of Williamson Act lands with nonagricultural uses. The section states that "the erection, construction or maintenance of …water...facilities are hereby determined to be compatible uses within any agricultural preserve."

Summary

In summary, under Alternative 1, temporary and permanent impacts to lands that are under Williamson Act contract are considered less than significant.

Alternative 2

Alternative 2 would affect the same 9 properties under Williamson Act contracts as those discussed for Alternative 1, because the facilities to be constructed are the same. Therefore, impacts under this alternative would be considered less than significant.

Alternative 3

Under Alternative 3, up to 4 properties under Williamson Act contracts would be affected by construction of the Delta-Transfer Pipeline, the Transfer-LV Pipeline, and Power Option 1. Impacts associated with these facilities were discussed under Alternative 1. Because Alternative 3 would not involve construction of the Transfer-Bethany Pipeline, less contracted land would be affected than under Alternative 1. Like Alternative 1, impacts under this alternative would be considered less than significant.

Alternative 4

Under Alternative 4, none of the facilities proposed for expanding the reservoir to 160 TAF or providing recreation facilities would impact lands under Williamson Act contracts. There would not be any construction or associated impacts to Williamson Act lands related to conveyance facilities or new power supply facilities because these components would not be built under Alternative 4. There would be no impact.

Mitigation: None required.

Impact 4.8.4: The project would involve changes in the environment that, due to their location or nature, could contribute to cumulative impacts from conversion of Important Farmland to nonagricultural uses. (Less than Significant for Alternative 4; Less than Significant with Mitigation for Alternative 3; Significant and Unavoidable for Alternatives 1 or 2)

Alternative 1

The Los Vaqueros Reservoir Expansion Project is a water infrastructure project, not a land development project, and would not result in impacts to agricultural resources that would be expected with a typical development project. The proposed project would not result in further urbanization of the area, make agricultural land vulnerable to the pressures of urbanization, or lead to the additional loss of farmland to nonagricultural uses. Nonetheless, under Alternative 1, about 22 acres of Farmland of Statewide Importance would be permanently removed from agricultural use to allow construction of the new Delta Intake and Pump Station.

Most agricultural lands in Contra Costa and Alameda Counties are in the eastern portion of each county. In 2006 (most recent inventory), the total acreages of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in Contra Costa County and Alameda County were 41,619 and 8,439 acres, respectively. A reduction of 2,881 acres of Important Farmland for Contra Costa County and of 826 acres for Alameda County has occurred between 2004 and 2006 (see Tables 4.8-1 and 4.8-2) (DLRP, 2008).

With or without the project, the trend of land conversion from agricultural uses to urban and other nonagricultural uses (e.g., wildlife habitat enhancement) in these counties will continue. The land development projects considered in this Environmental Impact Statement/Environmental Impact Report assessment of cumulative impacts are listed in Table 4.1.2 and also listed in Appendix I, Table I-1, Potential Projects for Cumulative Effects Evaluation. Projects that are located in areas with agricultural use that would contribute to loss of Important Farmland to non-agricultural uses include the 1,100 acre Cecchini Ranch and the Discovery Bay/Byron Wastewater Treatment Plant Upgrade, both within the urban limit line of Discovery Bay. The CCWD AIP and its associated pipeline to the Old River Intake and Pump Station are located on Victoria Island, an active farming area. A number of public works projects (Zone 7 Altamont Water Treatment Plant and Pipeline; DWR South Bay Aqueduct Enlargement Project; various Road Safety Improvement and Widening Projects) could further contribute to the ongoing loss of Important Farmland through direct loss by conversion of farmland and/or by supporting the change of agricultural areas to more urban uses. The ongoing Mountain House Community development would continue to contribute to the loss of farmland through its subdivision of grazing and other agricultural land for urban uses.

As a number of the proposed projects are not yet in the environmental planning stage, the acreage of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance that could be converted by these projects is not known. However, in general, the acreage of Important Farmland in Contra Costa County and in Alameda County is expected to continue to decline. Alternative 1 would contribute incrementally to this decline.

The incremental contribution of farmland conversion associated with the proposed project would be a cumulatively considerable contribution to an existing significant cumulative impact. This impact would be significant.

Alternative 2

Under Alternative 2, which would construct the same facilities as Alternative 1, the proposed project would contribute to a significant cumulative impact with respect to the cumulative conversion of Farmland of Statewide Importance to nonagricultural use, even with implementation of Mitigation Measure 4.8.2a and 4.8.2b. The incremental contribution of farmland conversion associated with the proposed project would be a cumulatively considerable contribution to a significant cumulative impact. Under Alternative 2, this impact would therefore be significant.

Alternative 3

Under Alternative 3, no Important Farmland would be permanently impacted because this Alternative does not involve construction of the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. With implementation of Mitigation Measure 4.8.2a, Alternative 3 would not contribute to the cumulative loss of Important Farmland. Before mitigation, Alternative 3 would result in a significant impact.

Alternative 4

Under Alternative 4, no Important Farmland would be permanently impacted because this Alternative does not involve construction of the New Delta Intake and Pump Station or new water conveyance pipelines through agricultural areas. Furthermore, Alternative 4 would not involve construction of Power Supply facilities. Alternative 4 would not contribute to the cumulative loss of Important Farmland.

Mitigation Measure

Implementation of Agricultural Resources Mitigation Measures 4.8.1 and 4.8.2 (a and b) would minimize potential impacts under Alternatives 1 and 2; however, those measures would not reduce cumulative impacts to less-than-significant levels. The level of significance after mitigation would be a significant and unavoidable cumulative impact for Alternatives 1 and 2. With Mitigation Measure 4.8.2a, Alternative 3 would not result in a cumulatively considerable contribution to a significant impact on agriculture.

Impact Significance after Mitigation: Significant and Unavoidable for Alternatives 1 or 2; Less than Significant for Alternatives 3 and 4.

4.9 Transportation and Circulation

This section describes the existing transportation facilities in the project study area, including local and regional roadways, transit service, and bicycle routes as well as existing traffic conditions. This section focuses primarily on project construction effects, including potential impacts to (1) roadways that are adjacent to or within the construction corridor of various project facilities and could therefore be affected by construction, and (2) roadways that are potential routes that construction workers, materials delivery, and other equipment trucks could use to access construction sites. The effects on traffic circulation from project operation are also addressed.

4.9.1 Affected Environment

Regulatory Setting

Federal and State

The California Department of Transportation (Caltrans) is responsible for planning, designing, constructing, operating, and maintaining all State-owned roadways in Contra Costa and Alameda Counties. Federal highway standards are implemented in California by Caltrans.

Local

Contra Costa County

The Contra Costa County General Plan (2005) contains goals and policies to inform agencies of the County-approved ways to maintain an efficient traffic circulation network. Such goals and policies discuss right-of-way requirements (Policy 5-5), emergency response efficiency (Policy 5-16), and roadway development (Policy 5-4). The general plan also outlines level of service (LOS) standards and routes of regional significance. For specific policies related to transportation and circulation in Contra Costa County, see Appendix E-2. The County has not designated local truck routes nor adopted specific policies regarding management of construction activities.

Alameda County

The Alameda County East County Area Plan (2002) contains goals and policies to inform agencies of the County-approved ways to maintain an efficient circulation network in the eastern portion of the county. Such goals include creating and maintaining a balanced multimodal transportation system (General Transportation Goal 1), cooperating with other regional transportation plans (Policy 178), integrating pedestrian use into the transportation system (Policy 212), and mitigating exceedances of LOS standards (Policy 193). The plan also discusses lane requirements for intercity arterials (Policy 193) and right-of-way requirements in the eastern portion of the county. For specific policies related to transportation and circulation in Alameda County, see Appendix E-1. Alameda County has not designated local truck routes nor adopted specific policies regarding management of construction activities.

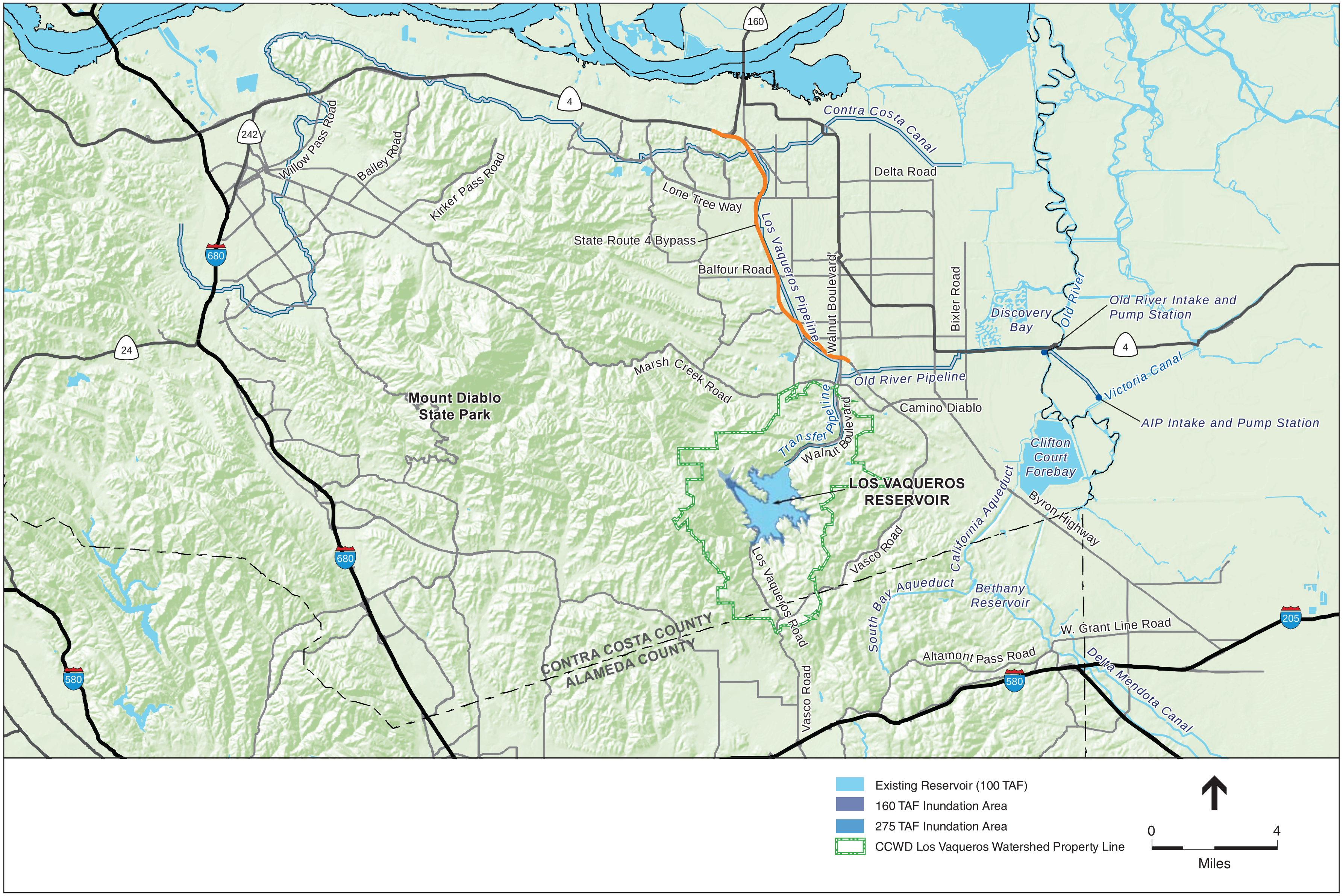
Regional Setting

Figure 4.9-1 shows the regional roadway network consisting of state highways, regional freeways, and county roads. **Figure 4.9-2** identifies the project facilities and the local and regional roadway network that could be affected by construction and operation of these facilities. Specific roadways are described below. **Table 4.9-1** indicates the highways and roads that would or could be used for project construction traffic and those that would be affected by actual project construction activities (i.e., where construction activities are proposed in, adjacent to or across roads). **Table 4.9-2** presents average daily traffic estimates for relevant regional roadways.

TABLE 4.9-1
ROADWAYS USED AND/OR AFFECTED DURING PROJECT CONSTRUCTION

Roadway	Potential Construction Activity Travel Routes [1]	Roadways Affected by Project Construction
Interstate Highway		
Interstate 5	Yes – provides regional and statewide access to the project region	No
Interstate 205	Yes – provides direct regional access to the project area	No
Interstate 580	Yes- provides direct regional access to the project area	No
Interstate 680	Possible – provides regional access to the project region	No
Regional Highway		
State Route 4 and SR 4 Bypass	Yes – provide direct access to the project area	Yes – Delta Transfer Pipeline construction proposed adjacent to SR 4 between Old River and Bixler Road. Possible new powerline construction proposed along SR 4 from just east of Bixler Rd to Bixler Rd.
Byron Highway	Yes – provides direct access to the project area from I-205	No
County Roads		
Vasco Road	Yes – provides direct local access from I-580 to the project area	Yes – Transfer-Bethany Pipeline construction proposed adjacent to Vasco Road for approximately 2 miles from SR 4 south.
Walnut Boulevard	Yes – provides direct local access to project area	Yes – Transfer-LV Pipeline construction proposed in and adjacent to Walnut Boulevard roadway between approximately Camino Diablo and the Los Vaqueros Watershed entrance.
Camino Diablo	Yes- provides direct local access to project area	Transfer-Bethany Pipeline construction proposed across Camino Diablo.
Marsh Creek Road	Possible – provides direct access to the project area	No
Hoffman Road	Yes – provides local access to Delta-Transfer Pipeline alignment	Yes – Delta-Transfer Pipeline and possible powerline facilities construction proposed along this road west of Bixler Road.
Byron Hot Springs Road	Yes – provides local access to the Transfer-Bethany Pipeline alignment	No
Armstrong Road	Yes – provides local access to the Transfer-Bethany Pipeline alignment	Yes – Transfer-Bethany Pipeline construction proposed along a segment of this road.

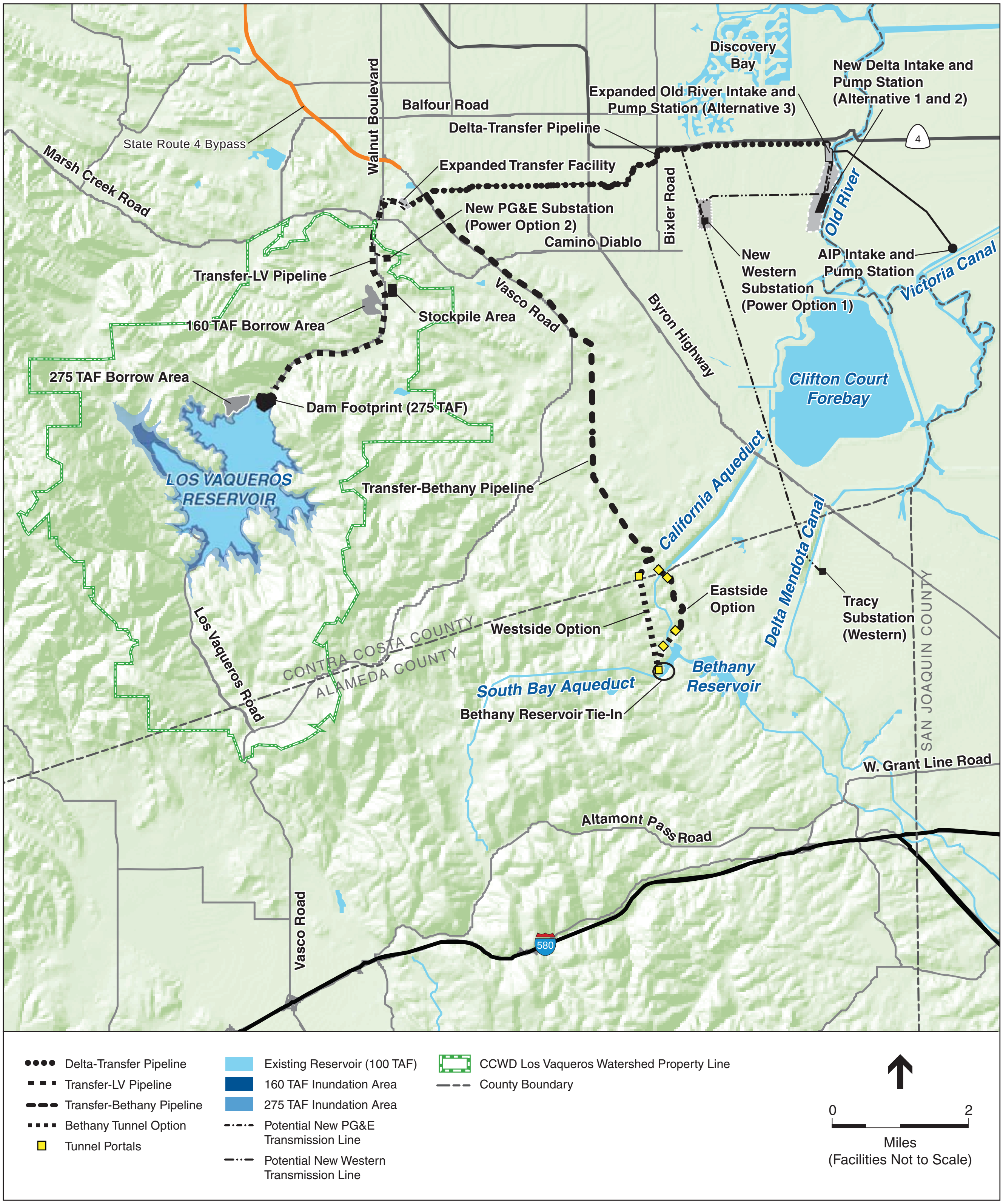
[1] Potential construction travel route could be used by construction workers and/or for construction equipment and materials hauling.



SOURCE: USGS, 1993 (base map); County of Contra Costa, 2005; and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.9-1
Regional Roadway Network



SOURCE: California State Automobile Association, 2007; and ESA, 2007

Figure 4.9-2
Project Area Roadways

TABLE 4.9-2
EXISTING AVERAGE DAILY TRAFFIC VOLUMES ON CALIFORNIA HIGHWAYS IN THE PROJECT AREA

Highway	Segment	Vehicles (% Trucks)[a]
State Route 4		
Contra Costa County	Willow Pass Road (Concord) to Railroad Avenue (Pittsburg)	125,000 to 157,000 (4.6% to 5.2%)
	Railroad Avenue to Contra Loma Boulevard (Antioch)	103,000 to 113,000 (4.6% to 5.2%)
	Contra Loma Boulevard to SR 160 (Antioch)	38,000 to 103,000 (4.6% to 5.2%)
	SR 160 to Lone Tree Way (Brentwood)	20,100 to 38,000 (13.8% to 15.4%)
	Lone Tree Way to Byron Highway (Brentwood)	16,700 to 23,800 (13.8% to 15.4%)
	Byron Highway to San Joaquin County line	9,700 to 19,400 (13.8% to 15.4%)
San Joaquin County	San Joaquin County line to Fresno Avenue (Stockton)	9,000 to 13,200 (9.8% to 16.5%)
	Fresno Avenue to I-5	16,000 to 29,000 (9.8% to 16.5%)
Interstate 580		
Alameda County	I-205 to Vasco Road	152,000 (10.2% to 12.5%)
	Vasco Road to North Livermore Avenue	176,000 to 184,000 (12.2%)

[a] Daily truck traffic as percent of total vehicle.

SOURCE: Caltrans, 2007.

State Route 4

State Route (SR) 4 is an east-west, four-lane highway that (as John Muir Parkway) connects Hercules at the Interstate 80 (I-80) junction to Martinez at the Interstate 680 (I-680) junction). East of Martinez, SR 4 becomes the California Delta Highway and passes through the cities of Concord, Pittsburg, and Antioch. The character of SR 4 changes at the Main Street interchange in Oakley, east of which SR 4 continues as a two-lane arterial roadway that passes through eastern Contra Costa County and then continues southward and eastward through the city of Brentwood and past Discovery Bay. SR 4 then crosses Old River and continues into San Joaquin County toward Stockton, where it intersects I-5. SR 4 crosses multiple waterways east of Discovery Bay, with generally narrow bridge crossings and curves in the road at entrances to the waterway crossings.

The SR 4 Bypass is a cooperative effort between Contra Costa County and the cities of Antioch, Brentwood and Oakley to ease traffic congestion through the Brentwood and Oakley areas by replacing the existing SR 4 from just south of the Main Street Interchange to the existing interchange with Marsh Creek Road. It has been constructed in three segments, with Segments 1 and 2 (from the existing SR 4 east of Hillcrest Avenue, in the Antioch/Oakley area, to Balfour Road in Brentwood) and Segment 3 (Balfour Road to Marsh Creek Road, then along Marsh Creek Road to the existing SR 4 in Byron, with a Vasco Road Extension from Marsh Creek Road to Vasco Road at Walnut Boulevard) now open (SR 4 Bypass Authority, 2008).

Regional Interstates

I-580 is the major east-west truck travel route and main throughway in eastern Alameda County that connects to the Sacramento and San Joaquin Valleys. Other interconnecting regional transportation facilities include I-680, Interstate 205 (I-205), and I-5. The freeway interchanges that provide access to the project area road network are I-580 at Vasco Road and Grant Line Road, I-205 at West Grant Line Road (which connects to the Byron Highway), and I-5 at SR 4 (West Charter Way).

Local Setting

See Table 4.9-1, presented earlier in this section, for an overview of the roadways in the project area that would be used for construction traffic and/or affected by project construction activities. **Table 4.9-3** presents average daily traffic estimates for relevant local roadways. Weekday traffic within the east Contra Costa County area consists primarily of commuter traffic during morning and evening peak-traffic periods, and a mix of trips generated by residential, agricultural, and commercial/industrial uses throughout the day.

TABLE 4.9-3
EXISTING AVERAGE DAILY TRAFFIC VOLUMES ON LOCAL ROADWAYS IN THE PROJECT AREA

Roadway	Segment	Vehicles
Contra Costa County		
Vasco Road	Walnut Boulevard to Camino Diablo	18,000
	Camino Diablo to Alameda County line	21,790
Walnut Boulevard	Vasco Road to Camino Diablo	17,840
Camino Diablo	Byron Highway to Vasco Road	2,290
	Vasco Road to Walnut Boulevard	7,785
	Walnut Boulevard to Marsh Creek Road	1,815
Byron Highway	SR 4 to Camino Diablo	11,500
	Camino Diablo to Alameda County line	10,980
Alameda County		
Vasco Road	South of Dalton Avenue	24,110
	North of Dalton Avenue	23,130

SOURCES: Contra Costa County Traffic Engineering Division, 2005; City of Livermore, 2007

Vasco Road

Vasco Road is a major thoroughfare for travelers heading to the eastern and southern San Francisco Bay Area from the cities of Stockton, Brentwood, and Oakley. Locally, North Vasco Road heads south from Walnut Boulevard near Brentwood and crosses into Alameda County as it extends to

I-580. Vasco Road is primarily a two-lane arterial (with some four-lane segments, and some segments with two lanes in one direction and one lane in the opposite direction) that has heavy use during morning and evening commute hours. As described above, the last segment of the SR 4 bypass, including an extension of Vasco Road from Walnut Boulevard to Marsh Creek Road, has been completed and is now open for use.

Byron Highway

Byron Highway is a two-lane highway that extends across southeastern Contra Costa County into San Joaquin County connecting to I-205. It

Walnut Boulevard

Walnut Boulevard is a two-lane road that travels south from Brentwood and serves as the north entrance of the Los Vaqueros Reservoir watershed. Walnut Boulevard extends as Los Vaqueros Road to the existing Los Vaqueros Dam.

Camino Diablo

Camino Diablo is a two-lane road that heads west from the Byron Highway through the town of Byron; it crosses Vasco Road and Walnut Boulevard and ends at Marsh Creek Road.

Marsh Creek Road

Marsh Creek Road is a two-lane road that travels from just east of SR 4 (Byron Highway) near Discovery Bay westward to the town of Clayton. Marsh Creek Road heads west just south of the city of Brentwood and then travels south until it reaches Camino Diablo, where it again heads west. As described above, the last segment of the SR 4 bypass, which ties in to Marsh Creek Road, has been constructed and, as part of that work, Marsh Creek Road has been improved to Caltrans standards for a conventional two-lane expressway from west of Walnut Boulevard to the existing SR 4 (Byron Highway/California Delta Highway) in Byron.

Hoffman Road, Byron Hot Springs Road, Armstrong Road

These three roads are each local, two-lane paved rural roads in the project area providing access to rural residences and farmland areas.

Routes of Regional Significance

The Contra Costa Transportation Authority has established routes of regional significance. These routes are the roads that connect two or more regions in the county, cross county boundaries, carry a significant amount of through traffic, or provide access to a regional highway or transit facility. Regional routes of significance include all state highways and freeways as well as key arterials. The regional routes within the project area that would be affected by construction and operational traffic for the Los Vaqueros Reservoir Expansion Project include: Vasco Road from Walnut Boulevard to the Alameda County line; Camino Diablo from Marsh Creek Road to Vasco Road; and the SR 4 Bypass and SR 4 from Bixler Road to Old River.

Public Transit

The project area is served by two transit agencies that provide bus service to areas in eastern Contra Costa and Alameda Counties: the Eastern Contra Costa Transit Authority (Tri-Delta) and Livermore Amador Valley Transit Authority (LAVTA).

Eastern Contra Costa Transit Authority

Tri-Delta Transit operates 14 local bus routes and serves the cities of Brentwood, Antioch, Oakley, Pittsburg, and Bay Point. Bus routes 300, 383, 386, and 391 operate on the Brentwood Boulevard portion of SR 4 in the project area, but do not extend south through the project area. The Authority operates a regional route that provides bus service from Antioch, Oakley and Brentwood south to Livermore and Dublin Bart; the route follows SR 4 to Byron Highway south to I-580.

LAVTA (Wheels)

Wheels is a service of the LAVTA, which provides local public transit service to the cities of Dublin, Livermore, and Pleasanton and to the adjacent unincorporated areas of Alameda County. Lines 11 and 15 cross and run along portions of Vasco Road up to about one mile north of I-580, but not north of Livermore, or in to the project area north in Contra Costa County.

Bikeways/Pedestrian Circulation

The regional network of bicycle facilities includes a variety of Class I (bicycle paths), Class II (bicycle lanes, striped in roads), and Class III (bicycle routes without striping) bikeways within the cities and communities of Contra Costa County. The closest Class I, II, and III bikeways to the project sites are in Brentwood, over two miles north of the project area; none of these bikeways would be affected by project construction due to the fact that no project components would be constructed in or adjacent to bikeways, and it is anticipated that construction traffic would not use local Brentwood streets.

4.9.2 Environmental Consequences

Methodology

Construction

Construction activities for major infrastructure projects such as the Los Vaqueros Reservoir Expansion Project can result in short-term traffic and circulation impacts as a result of temporary increases in traffic from construction workers and transport of equipment and materials as well as construction activities in or near roadways that affect traffic flow and/or property access. The analysis of project construction effects on traffic, circulation and access is based on the description of project construction activities and schedule presented in Chapter 3, Project Description. Construction activities are described for each proposed facility throughout Section 3.5 and a summary of the overall project construction schedule, work force and key construction assumptions is presented in Section 3.5.7.

The impact analysis focuses on Alternative 1, which involves the maximum extent of new and/or expanded facilities and therefore represents the most extensive construction activity among the alternatives. For purposes of this impact analysis it is assumed that construction activity would be occurring at all facility sites at the same time, representing a peak construction scenario. The actual schedule of construction activities would be determined after final design and largely by the construction contractors. While some phasing of construction activities would be expected, in order to complete the facilities included in Alternative 1 on the proposed three-year construction schedule, some level of construction activity would need to occur concurrently at most facility sites. Construction characteristics, including proposed labor and equipment, location of construction, and rate of construction, were used to conservatively estimate the manpower level and number of vehicles that would be required for facilities installation.

Alternative 2 is the same as Alternative 1 in terms of facilities construction and therefore shares the same construction assumptions. Alternatives 3 and 4 involve fewer new or expanded facilities than Alternatives 1 and 2 and would generate less construction impact to traffic circulation and access than described for Alternatives 1 and 2.

Key construction scenario assumptions used in the analysis of potential project effects on traffic and circulation during construction include:

- A 3-year overall construction schedule for Alternatives 1, 2, and 3; a 2-year construction schedule for Alternative 4.
- Double-shift and Saturday work are implemented.
- The construction labor force for Alternatives 1 and 2 would consist of as many as six crews of about 50 to 70 workers each plus construction management personnel for a maximum total of up to 400 construction workers at all work sites at one period of the construction.
- The equipment specified for clearing/excavation/foundation, building construction, and interior mechanical/electrical activities would operate for about 8 to 16 hours a day (up to two shifts per day) over approximately 24 months. Equipment operations would occur over two 8-hour shifts typically extending from 6 a.m. to 10 p.m. Equipment might be removed from the site when no longer needed for construction activities.
- During road work, utility, and landscaping activities, equipment would also be used 8 to 10 hours a day, but the duration would decrease to about one year. Some equipment such as backhoes and light-duty trucks would be used during multiple stages of project construction, and therefore overlap of equipment types and duration is expected.
- An estimated 25 percent of the excavated soil would be hauled away from the work sites for disposal or reuse elsewhere. The remaining 75 percent would be stockpiled near the construction work zones for later use as backfill material and/or sidecast on to adjacent land. Trench and tunnel dimensions based on pipe diameters and lengths were used to calculate the amount of hauled material.

This analysis relies on available information, a field inventory of the project area, and estimates of daily vehicle trips generated by project-related activities, augmented by professional traffic engineering judgment. Existing traffic volumes on project area roadways were gathered from Contra

Costa County and Alameda County documents and Caltrans' website (2007a and 2007b). Field reconnaissance was undertaken to determine characteristics of roads that are proposed to accommodate construction-generated vehicle trips, including the number of travel lanes and land uses served by the affected roadways. Estimates of increased roadway traffic volumes generated by the project were compared to existing traffic volumes, and the effect of that percent increase on traffic flow was judged by a qualified expert in traffic analysis based upon experience and knowledge of the relevant roadway facilities and conditions.

Project Operation

The analysis for long-term increases in traffic associated with project operation considers the extent of additional employees required to operate the expanded facilities and the need for additional facilities maintenance activities. Project operation is projected to require very few additional employees, less than ten, and require little additional maintenance activity. Current maintenance and inspection trips to monitor the existing Los Vaqueros system would simply be extended to inspect new and expanded facilities. The potential for increased visitor traffic to the expanded recreation facilities within the Los Vaqueros Watershed is also evaluated.

Significance Criteria

The thresholds for determining the significance of impacts for this transportation and circulation analysis are based on the environmental checklist in Appendix G of the CEQA Guidelines as well as professional traffic engineering judgment. These thresholds also encompass the factors taken into account under the National Environmental Policy Act to determine the significance of an action in terms of its context and the intensity of its effects.

For this analysis, the project would be considered to have a significant impact on transportation and circulation if it would:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (e.g., result in a substantial increase in traffic congestion affecting vehicle or transit circulation);
- Substantially impede access to local streets or adjacent uses, including access for emergency vehicles;
- Substantially increase traffic safety hazards due to incompatible use (e.g., construction in or adjacent to roadways, heavy truck traffic, and roadway wear-and-tear);
- Exceed, either individually or cumulatively, a level of service (LOS) standard established by the county congestion management agency for designated roads or highways.

The following transportation, traffic and circulation issues (including some identified in Appendix G of the CEQA guidelines) do not apply to this project and, as a result, are not addressed in this analysis, as explained below.

- Interference with Rail Service or Operations. Bore-and-jack construction techniques (see Chapter 3, Project Description) would be used to install project pipelines underneath railroad tracks at the few places where a project pipeline crosses an existing railroad corridor. This construction technique involves tunneling beneath railroad tracks without compromising their stability or restricting rail activity. Therefore, the project alternatives would not affect rail service or operation.

- Change in Air Traffic Patterns resulting in substantial safety risks. Project alternatives would not affect air traffic patterns of the Byron Airport in the project area. Although some of the proposed pipelines and electrical transmission lines would be located within the Byron Airport Influence Area, construction equipment and project components would not exceed height restrictions within this area. Also, the project alternatives would not alter air traffic patterns nor result in substantial safety risks associated with airport operations (see airport impact discussion in Section 4.7 Land Use, under impacts 4.7.3 and 4.7.4).

- Result in inadequate parking capacity. Construction of facilities under each project alternative would not disrupt or displace existing parking facilities. Facilities construction would occur on existing CCWD property, along public road rights-of-way or across private property in agricultural use. There is no street parking provided on most roads in the project area. Parking areas would be needed to accommodate construction workers at each facility site but such parking areas would be provided within the construction easement or work area onsite. Construction workers would not park in areas used by others for parking.

- Increased Hazards Due to a Design Feature. The project alternatives would not include new design features for any roadways (e.g., new facilities or obstructions within public roadways) or alterations of existing features (e.g., road realignment). Therefore, the project alternatives would not result in hazards caused by a design feature.

- Conflicts with Adopted Policies, Plans, or Programs Supporting Alternative Transportation. Project alternatives would not directly or indirectly eliminate existing or planned alternative transportation corridors or facilities (e.g., bike paths, lanes, bus turnouts, etc.). In addition, project alternatives would not include changes in policies or programs that support alternative transportation, and it would not construct facilities in locations in which future alternative transportation facilities are planned. Therefore, the project alternatives would not conflict with adopted policies, plans, or programs supporting alternative transportation. The potential effect of project construction on existing bus transit service in the project area is discussed in Impact 4.9-1.

Impact Summary

Table 4.9-4 provides a summary of the impact analysis for issues related to transportation and circulation based on actions outlined in Chapter 3.

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Because no additional vehicle trips would be generated, this alternative would not result in any adverse environmental effects with respect to transportation and circulation. Further, the No Project/No Action Alternative would not contribute to any cumulative transportation impacts.

TABLE 4.9-4
SUMMARY OF IMPACTS – TRANSPORTATION AND CIRCULATION

Impact	Project Alternatives			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.9.1: Project construction activities would intermittently and temporarily increase traffic congestion due to vehicle trips generated by construction workers and construction vehicles on area roadways.	LSM	LSM	LSM	LS
4.9.2: Project construction activities would intermittently and temporarily impede access to local streets or adjacent uses, including access for emergency vehicles and could substantially increase traffic hazards due to construction in or adjacent to roads or due to possible road wear.	LSM	LSM	LSM	LS
4.9.3: Traffic associated with operation of project facilities, including the expanded recreation facilities, would not exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways.	LS	LS	LS	LS
4.9.4: Construction of project alternatives, when combined with construction of other future projects, could contribute to construction-related short-term cumulative impacts to traffic and transportation (traffic congestion, access, and traffic safety).	LSM	LSM	LSM	LS

NOTES:

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact 4.9.1: Project construction activities would intermittently and temporarily increase traffic congestion due to vehicle trips generated by construction workers and construction vehicles on area roadways. (Less than Significant with Mitigation for Alternatives 1, 2, and 3; Less than Significant for Alternative 4)

Alternative 1

As described in Chapter 3.0 Project Description and summarized in the impact methodology section above for construction, construction activities at all of the facility sites included in Alternative 1 could involve up to six construction crews of 50 to 70 workers each plus construction management personnel, for a total of up to 400 construction workers active on the project at one time. For purposes of impact analysis it is assumed that each construction worker makes one daily round-trip to and from the project area resulting in 400 round trips per day. An additional 100 round trips per day (25 percent of workers) are added to this count to reflect the assumption that some construction workers would make another trip to and from a construction site during the day (e.g., for lunch). Thus, for the peak construction activity period scenario it is assumed that construction workers contribute a total of 500 round-trips per day to roads within the project area.

Projected equipment and materials needs were used to estimate truck trips required to support construction at each site. Materials hauling requirements for this project are minimized by several features of this project including: 1) most of the material required for the dam expansion would come from borrow areas within the CCWD watershed; 2) most of the material from the existing dam would be reused and any minor amounts of remaining material would be disposed of onsite within the reservoir inundation area; and 3) up to 75 percent of the materials removed from the pipeline trenches would be reused as backfill or spread out over adjacent range land, eliminating the need to haul this material off site for disposal or import additional backfill materials.

Construction equipment (refer to Table 3.7) would be delivered to and removed from each project facility site in phases for site clearing, grading, excavation and foundation work; structure and building construction; interior, mechanical and electrical work; and finally, for road work, utilities and site finishing / landscaping. Materials that need to be imported for project construction would include sand filters and gravel drains for the reservoir that would be imported from commercial sources within the region (expected haul distances of up to 30 miles), and for all facilities both raw and pre-fabricated materials that would be transported to the project site such as gravel, aggregate, bulk cement, steel, asphalt, pipeline segments, pre-fabricated building materials, and mechanical and electrical equipment. Materials to be removed from project facility sites would be limited to some building materials that could not be reused as part of facilities expansion and excess excavated material. Most of the excavated material is expected to be reused on site and extra materials would, in most cases, be used as clean fill on other development sites. In some instances it might be necessary to haul materials to a specific waste disposal site.

Appendix H presents a breakdown of the truck trip assumptions developed for each of the eight facilities included in Alternative 1 based on the construction scenario and basic facility design information: 1) reservoir expansion, 2) Transfer Facility expansion, 3) new Delta Intake and Pump Station, 4) Delta-Transfer Pipeline, 5) Transfer-LV Pipeline, 6) Transfer-Bethany Pipeline and South Bay Connection, 7) Power Supply (Option 1 or 2), and 8) Recreation facility replacement and expansion within the Los Vaqueros Watershed. In summary, under the peak construction activity scenario that assumes construction activity occurs on all eight facilities concurrently, total daily truck trips to the project area could total approximately 1,150 round-trips (2,300 one-way trips) per day. While it is assumed that construction crews would work two shifts per day for a total 16-hour work period between approximately the hours of 6 am and 10 pm, it is expected that materials and equipment would likely be delivered within a 10-hour, day-time period per day. Under this assumption, truck trips scheduled through out the day to deliver and remove materials from project facilities sites would average approximately 230 trips per hour.

Assuming concurrent construction at all project sites, the combination of construction worker commute and truck trips for equipment and materials hauling would generate the addition of approximately 1,650 daily round trips to the project area (up to 3,300 one-way trips per day). This scenario reflects a conservative peak construction activity scenario for the extent of construction traffic that would be generated by the project.

Assessment of the short-term effect that project construction traffic could have on local and regional roads includes review of existing traffic volume information and consideration of both the percentage increase the project construction traffic would contribute over existing conditions and the capacity of the road to handle the additional traffic. Since the number of vehicles on roads vary from day-to-day and over the course of a day and routinely range plus or minus five percent, a change in traffic volume of five percent or less is generally not perceptible to the average motorist. Further, although in some cases project-generated construction traffic might represent more than a five percent increase in traffic volume over existing conditions, the effect on traffic flow is not substantial because traffic volumes would remain well within the design carrying capacity levels for these roads. As a reference point, depending on design features, the carrying capacity of a typical two lane local road is 20,000 to 25,000 vehicles per day. Traffic volume on project area roads is typically highest during morning and evening peak commute hours (generally between 7 am to 9 am and 4 pm to 6 pm); traffic increases that occur during these peak periods may exacerbate short-term congestion.

The main regional highways expected to be used to access the project area are I-5, I-205, and I-580, which would provide access to the project area from the east and south (see Figure 4.9-1 and Table 4.9-1). Some construction workers and trucks delivering equipment and materials would also come to the project area from the west, using I-680, I-580, and/or SR-4 but these are not expected to carry the majority of construction traffic for the project. The existing volume of traffic on I-580 is shown on Table 4.9-2; in the stretch of highway around the Vasco Road exit that leads to the project area, the existing average daily traffic volume ranges from 150,000 to 184,000 vehicles per day. Even if all 3,300 daily project construction trips used I-580, this level of short-term traffic increase would represent two percent or less of the existing traffic volume; as such this would not be a substantial traffic increase on major highways like I-580.

The main roads providing access from the highway system to the project area and access to specific facility sites include: Vasco Road, Byron Highway, SR-4 and the SR 4 Bypass (see Figure 4.9-1 and 4.9-2). Construction traffic to and from the eight different project facility sites would be distributed on each of the roads. For the three pipeline facilities, construction traffic would use different roads to access different portions of the alignments such that there is not a single point of access.

As shown on Figure 4.9-2, Vasco Road provides access to the Los Vaqueros Watershed, both the south and north entrances, and would be used by construction workers and truck haulers going to the dam expansion site and the recreation facility replacement and expansion sites within the watershed. Construction workers, equipment and materials haulers would use both the south and north entrance to the watershed. Vasco Road would also be used by project construction traffic going to and from the Transfer Station Expansion site, the Transfer-LV Pipeline and to access the western portion of the Delta-Transfer Pipeline route, Power Option 2, and the northern portion of the Transfer-Bethany Pipeline. Assuming concurrent construction at all sites and a concentration of work being completed at facility sites accessed by Vasco Road, approximately two-thirds of the total project-generated construction trips, or 2,000 trips per day could occur on Vasco Road during the peak project construction period. Compared to the existing average daily traffic on Vasco Road (shown on Table 4.9-3), this would represent about a 10 percent increase in daily traffic during the peak construction period. On an hourly basis, this would represent an additional 200 trips per hour. In the off-peak commute hours, this additional traffic would not represent a substantial increase in traffic volume that would appreciably affect traffic congestion; however if this project construction traffic increase were to occur during the peak commute hours (typically 7 am to 9 am and 4 pm to 6 pm), then this could result in a noticeable increase in traffic congestion, and might delay emergency service providers traveling through this area as well.

Walnut Boulevard, which provides access from the north to the Los Vaqueros Watershed and connects with Vasco Road, carries a similar but slightly lower volume of existing daily traffic (18,000 trips per day; Table 4.9-3) compared to Vasco Road. Some construction workers and haul trucks would use this road for some project construction-related trips, though not to the extent expected to use Vasco Road. Project construction traffic impacts to Walnut Boulevard would be similar but less than that described above for the peak project construction traffic scenario for Vasco Road.

Byron Highway would provide access to the Delta-Transfer Pipeline alignment, the new Delta Intake and Pump Station, Power Option 1 and portions of Power Option 2, and most of the Transfer-Bethany Pipeline. Similar to the assumptions made about the use of Vasco Road, assuming concurrent construction activity on all project sites accessed by Byron Highway, about one-third of the total estimated construction traffic, a maximum of approximately 1,250 trips per day, would use this road. This represents about 125 trips per hour, or about an eleven percent increase in the existing average daily traffic volume on this highway (see Table 4.9-3). In the off-peak commute hours, this additional traffic would not represent a substantial increase in traffic volume that would appreciably affect traffic congestion; however if this project construction traffic increase were to occur during the peak commute hours (typically 7 am to 9 am and 4 pm to 6 pm), then this could result in a noticeable increase in traffic congestion.

SR 4, in the segment west of Old River to Byron Highway, would be used to access the new Delta Intake and Pump Station site and the eastern portion of the Delta-Transfer Pipeline. Peak project construction traffic associated with these two facilities would total about 708 trips per day, or an average of 78 additional trips per hour. Compared to existing average daily traffic volumes for SR 4 in the reach between Byron Highway and the San Joaquin County line to the east, the project could contribute an increase of 4 to 7 percent (See Table 4.9-2). As for Vasco Road and the Byron Highway, while this is not a substantial traffic flow increase for this roadway, if this project construction traffic increase were to occur during the peak commute hours, then this could result in a noticeable increase in traffic congestion, and might cause delays for emergency service providers traveling through this area as well.

For the smaller, more local roads in the project area such as Hoffman Road, Byron Hot Springs, and Armstrong Road, project-related construction traffic would use these roads to access a specific facility site. Hoffman Road provides local access to the western end of Delta-Transfer Pipeline; both Byron Hot Springs Road and Armstrong Road would be used to access portions of the Transfer-Bethany Pipeline alignment. Existing traffic on these roads is light. Project construction traffic could represent a noticeable percentage increase in traffic on these roads but the total traffic including project construction vehicles trips would remain well below the road capacity and would not result in congested traffic flow conditions.

With respect to project construction effects on existing bus transit services, Eastern Contra Costa Transit Authority operates a regional bus route that uses the Byron Highway and LAVTA operates a route that extends into North Livermore along Vasco Road about one mile north of I-580. The short-term traffic increases that would occur on these roads during project construction would not disrupt transit service but, as noted, above, traffic increases during morning and evening peak commute hours could increase traffic congestion and add to transit delays. Mitigation measures are proposed to minimize project construction traffic during peak commute hours.

Alternative 2

Alternative 2 project components would be the same as those proposed under Alternative 1; therefore, potential projected-related traffic impacts on traffic flow and congestion, would be the same as described above for Alternative 1. During morning and evening peak commute hours, project-related construction traffic could cause a substantial increase in traffic and congestion conditions.

Alternative 3

Impacts under Alternative 3 would be less than those analyzed under Alternative 1, above. Under this alternative, the Old River Intake and Pump Station would be expanded instead of constructing the new Delta Intake and Pump Station. In addition, there would be no construction of a Transfer-Bethany Pipeline. All other facilities would be as proposed under Alternative 1. Consequently, Alternative 3 would generate total estimated peak construction period traffic of about 2,340, or about 70 percent of the amount estimated for Alternative 1. Without construction of the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline it is expected that Byron Highway would receive less project construction traffic than under Alternative 1, although this road would still be used to some extent by construction traffic accessing the project area and specific project sites such as the Delta-Transfer Pipeline alignment.

Since this alternative still includes expansion of the reservoir to 275 TAF, expansion of the Transfer Facility and construction of the Delta-Transfer and Transfer-LV Pipelines along with additional power, Vasco Road, Walnut Boulevard, and Camino Diablo would experience similar though lower levels of project construction traffic increases as described for Alternative 1. Other roads affected by project construction traffic increases under Alternative 1 would not be affected under Alternative 3 including Byron Hot Springs Road, and Armstrong Road. Although Alternative 3 would generate less project construction traffic than Alternative 1, project construction traffic could still add to congestion on project area roads, particularly during morning and evening peak commute periods. Therefore, mitigation measures are also proposed for this alternative to minimize peak hour traffic increases.

Alternative 4

Impacts under Alternative 4 would be substantially less than those analyzed under Alternative 1 because this alternative involves construction of a smaller reservoir expansion and upgrade but not expansion of the Transfer Facility and does not include any of the other major intake or pipeline facilities proposed under Alternative 1. The total estimated peak construction period traffic for this alternative would be approximately 425 vehicle trips per day, or about 13 percent of the amount of peak construction traffic estimated for Alternative 1. Under this alternative construction activity would occur primarily within the Los Vaqueros Watershed and the main access roads used would be Vasco Road and Walnut Boulevard, with some use of Byron Highway, SR 4, SR 4 Bypass, and Camino Diablo also expected. The level of traffic increases associated with project construction activity under this alternative would not be substantial enough to cause significant delays in traffic, including transit or emergency service providers. Project construction traffic effects would be less than significant and no mitigation is required.

Mitigation Measure

Measure 4.9.1a: Schedule project generated construction truck trips on Vasco Road, Byron Highway, SR 4, and SR 4 Bypass outside the peak morning and evening commute hours such that the frequency of construction truck trips on these roads would be no greater than one every two minutes (i.e., 30 trucks per hour) during these peak commute periods.

Measure 4.9.1b: Develop and implement a construction truck hauling plan that designates specific routes to be used to access the various project facilities when multiple facility sites are under construction concurrently so that project-generated construction traffic is dispersed over a number of roads in the project area.

Impact Significance after Mitigation: Less than Significant.

Impact 4.9.2: Project construction activities would intermittently and temporarily impede access to local streets or adjacent uses, including access for emergency vehicles and could substantially increase traffic hazards due to construction in or adjacent to roads or due to possible road wear. (Less than Significant with Mitigation for Alternatives 1, 2, and 3; Less than Significant for Alternative 4)

Alternative 1

Alternative 1 would involve construction of new pipelines and powerlines adjacent to, and in a few instances across, local roads in the project area. Although project pipelines and supporting electrical transmission powerlines are not proposed for construction directly within the paved travel lanes, project construction adjacent to roads could result in some road restrictions that affect the vehicle travel lanes in order to provide adequate construction work area adjacent to the roadway and/or adequate access to the construction right-of-way. Such major construction activity along roadways could create traffic safety hazards. In addition, construction adjacent to roadways would temporarily block vehicle, bicycle and pedestrian access to local streets or property driveways, including access for emergency vehicles. Finally, construction activity along roads as well as heavy truck traffic delivering equipment and materials to other facilities sites could result in road wear and damage that result in a driving safety hazard.

The Delta-Transfer Pipeline would be constructed adjacent to portions of SR 4 in the reach west of Old River to about Bixler and along a portion of Hoffman Road. The Transfer-LV Pipeline would be constructed along the southern end of Walnut Boulevard before it enters the Los Vaqueros Watershed. The Transfer-Bethany Pipeline would be constructed long the northern end of Vasco Road and along a segment of Armstrong Road. Under Power Option 2, an additional powerline would be extended along Hoffman Road, adjacent to the Delta-Transfer Pipeline. Construction along these roadways would restrict access to adjacent properties, which are primarily rural residences and farmland.

The use of trucks to transport equipment and material to and from the project work sites could affect road conditions on the designated haul routes by increasing the rate of road wear. The degree to which this impact would occur depends on the existing roadway design (pavement type and thickness) and existing condition of the road. Freeways, major arterials and collectors (e.g., I-580, SR 4, SR 4 Bypass, Byron Highway, and Vasco Road) are designed to accommodate a mix of vehicle types, including heavy trucks. The project's impacts are expected to be negligible on those roads. However, rural roadways may not have been constructed to support the weight and use of large construction equipment. Construction damage on designated haul routes used by construction vehicles would be a significant impact.

During the 36-month construction period, trucks delivering materials and equipment and removing debris would be entering and exiting unpaved areas along SR 4, Vasco Road, Camino Diablo, and Walnut Boulevard. In some areas this could create a traffic safety hazard requiring the need for traffic control. At times the presence of slow-moving trucks entering or exiting construction areas along roadways could pose a traffic hazard to other vehicles. The creation of potential traffic safety hazards as a result of project construction would be a significant impact.

Alternative 2

Alternative 2 project components would be the same as those proposed under Alternative 1; therefore, impacts would be the same as described above for Alternative 1.

Alternative 3

Under Alternative 3 the Delta-Transfer Pipeline, Transfer-LV Pipeline and Power Option 2 facilities would be constructed adjacent to project area roads as described under Alternative 1. The Transfer-Bethany Pipeline would not be constructed and thus there would be no construction adjacent to Vasco Road, Armstrong Road and Byron Hot Springs Road under this alternative. Construction adjacent to roadways could create a traffic safety hazard and would also restrict access to adjacent properties, including emergency service access. In addition to project construction activities adjacent to roads, like Alternative 1, under this alternative slow moving construction haul trucks entering and exiting project facility sites, particularly unpaved areas, could pose a traffic safety hazard and road wear due to heavy truck traffic could also result in a driving hazard. This impact would be significant.

Alternative 4

Construction activity under Alternative 4 would not create significant traffic safety hazards because there would be no construction adjacent to public roads that would create a driving hazard or restrict access to adjacent properties. In addition, this alternative would generate limited construction truck traffic compared to Alternative 1 and would not represent a significant traffic safety hazard or be expected to result in road wear that would create a driving hazard. The impact under this alternative would be less than significant.

Mitigation Measure

Measure 4.9.2a: Maintain alternative property access or trench plates on site to restore access for emergency vehicles at all times.

Measure 4.9.2b: Provide pre-notification to local police, fire, and emergency service providers of the timing, location, and duration of construction activities that could affect the movement of emergency vehicles on area roadways.

Measure 4.9.2c: Install traffic control devices as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones where needed to maintain safe driving conditions. This measure includes the use of signage to alert motorists of construction activities, potential hazards and travel detours as well as the use of flaggers when appropriate.

Measure 4.9.2d: Prior to construction, CCWD or its contractors will survey and describe the pre-construction roadway conditions on rural roadways and residential streets (including, but not limited to, Walnut Boulevard and Camino Diablo). Within 30 days after construction is completed, CCWD will survey these same roadways and residential streets in order to identify any damage that has occurred. Roads damaged by construction will be repaired to a structural condition equal to the condition that existed prior to construction activity.

Impact Significance after Mitigation: Less than Significant.

Impact 4.9.3: Traffic associated with operation of project facilities under all alternatives, including the expanded recreational facilities, would not exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways. (Less than Significant)

Alternative 1

Operation of the expanded Los Vaqueros Reservoir system facilities under Alternative 1 is projected to require only a few additional employees, less than ten. As a result, the project would result in negligible additional worker commute trips. In addition, maintenance and inspection of the expanded system facilities would be incorporated into the existing system operations and maintenance effort. Under Alternative 1 the new Delta Intake and Pump Station would be added to the District staff rounds for routine inspection. Day-to-day operations of this facility would be managed remotely and no employees would be permanently located at this new intake facility. The new pipelines added to the system under this alternative would be inspected as part of the District's routine system inspection effort. Since the Delta-Transfer and Transfer-LV Pipelines would parallel existing system pipelines, only the Transfer-Bethany Pipeline would add new territory for District maintenance staff to cover. Traffic trips for inspection and maintenance of the expanded system under Alternative 1 would result in a negligible increase in traffic trips on project area roads.

Traffic associated with operation of project facilities would also be generated by visitors to the expanded recreation facilities within the Los Vaqueros Watershed. Under Alternative 1, recreational facilities would be relocated and/or new facilities constructed to replace and expand the recreational facilities that would be displaced with the Los Vaqueros Reservoir Expansion Project. This includes the relocation of existing hiking trails and access roads along with installation of additional access roads and hiking trails and the relocation/addition of other facilities (i.e., fishing piers, picnic areas, restrooms and parking). Under Alternative 1, the major change would involve relocation of the Marina from the south end to the north end of the reservoir, with construction of a new Marina Complex plus an interpretive center and amphitheatre.

The majority of visitors to the watershed are fisherman as well as school-age children that participate in week-day educational programs sponsored by CCWD. Los Vaqueros Reservoir competes with other fishing locations in the region, most notably the Delta, for visitors. Although visitation to the Los Vaqueros Watershed may increase some in the future as population increases in the eastern Contra Costa County and Alameda County communities, this would be expected to occur with or without the project. The replacement and enhancement/expansion of recreation facilities proposed under this project alternative is not projected to result in significant additional recreational visitors to the watershed.

The most recent visitor data (attendance by month) for the six-year period July 2001 through June 2007 indicate that annual attendance at the Los Vaqueros Watershed ranged from about 18,000 to 29,000 visitors, with highest attendance during the spring and autumn. Data gathered between September 2001 and June 2002 (the most recent available information concerning point of origin) indicate that about 74 percent of the visitors to the reservoir use the south entrance. The proposed relocation of the Marina to the north end of the reservoir would shift vehicle access patterns on roadways in the project area. Information indicates that the origin of visitor trips is split equally between north/northwest and south/southwest of the reservoir. Thus, even with the relocation of Marina to the north end, the total two-way visitor-generated traffic volumes on area roads (e.g., Vasco Road, Marsh Creek Road, and I-580) would be similar to current conditions, that is – approximately half of the visitors would drive to the watershed from the north and the other would drive from the south. Traffic would not increase appreciably on the segment of Vasco Road between the southern watershed entrance and Walnut Boulevard, the northern watershed entrance. Visitors who live south/southwest of the reservoir would travel on northbound Vasco Road northeast of the existing Marina to reach the new Marina Complex on the north (an increase in traffic volume on Vasco Road), but visitors who live north/northwest of the reservoir would no longer travel on southbound Vasco Road to the existing Marina entrance location (a decrease in traffic volume on Vasco Road).

Traffic volumes might increase slightly on the roads providing direct access to the new Marina Complex (i.e., Camino Diablo, Walnut Boulevard and Los Vaqueros Road), but only by the amount of traffic currently using two-lane Los Vaqueros Road to access the existing southern Marina location. That amount of traffic varies from day to day, and season to season, but recent CCWD quarterly visitation reports indicate that between 900 and 2,000 people obtained fishing passes each month during the six-month period from July through December 2007. The maximum number of people per day over that period would be about 66 people. The impact of vehicle trips by those 66 people, spread over the course of a day, would be less than significant.

Alternative 2

Alternative 2 recreational components would be the same as those proposed under Alternative 1; therefore, impacts would be the same as described above for Alternative 1. Impacts would be less than significant under Alternative 2.

Alternative 3

Like Alternative 1, Alternative 3 would expand the existing reservoir to 275 TAF and result in construction of a new Marina Complex, interpretive center and additional trails. These recreational components would be the same as those proposed under Alternative 1; therefore, impacts would be the same as described above for Alternative 1, less than significant.

Alternative 4

Effects related to recreational traffic under Alternative 4 would be substantially less than those analyzed under Alternative 1 because Alternative 4 would not result in construction of a Marina Complex or a new interpretive center on the north end of the watershed. There would be no change in traffic patterns because the Marina would remain in an area accessed from the south, the same as existing conditions. Impacts would be less than significant under Alternative 4.

Mitigation: None required.

Impact 4.9.4: Construction of the project alternatives, when combined with construction of other future projects, could contribute to construction-related short-term cumulative impacts to traffic and transportation (traffic congestion, access, parking, traffic safety, and pavement wear-and-tear). (Less than Significant with Mitigation)

All Alternatives

The geographic scope of potential cumulative traffic impacts includes access routes to area freeways, and arterial and collector roadways used for haul routes and construction equipment/vehicle access to the Los Vaqueros Reservoir Expansion Project sites. Locating and operating the facilities associated with the project alternatives, described above, would not result in long-term traffic-related impacts. However, Impact 4.9.1 identifies short-term increases in traffic volumes associated with construction of the project facilities. Additional construction-related traffic impacts include temporary increases in traffic congestion, temporary and intermittent impedances to access and increased potential for traffic safety hazards. These impacts would be temporary, occurring during the estimated 36 month construction period.

The project has the potential to contribute incrementally to cumulative construction-related impacts as a result of (1) cumulative projects that generate increased traffic at the same time on the same roads as would the project facilities, causing increased congestion and delays such as land development projects; and (2) infrastructure projects in roads that would be used by project construction workers and trucks, which could affect detour routes around project work zones or could delay project-generated vehicles past the work zones of those other projects.

A review of planned development and infrastructure improvement projects in the project area indicate a few projects that could also generate construction-related traffic impacts at the time that the Los Vaqueros Reservoir Expansion Project is under construction (see Table 4.1-2). Implementation of circulation and detour plans, installing traffic control devices, and scheduling, to the extent feasible, truck trips outside of peak morning and evening commute hours (as identified for the project alternatives in Mitigation Measure 4.9.1) would reduce the project's contribution to the cumulative impacts. However, some traffic disruption and increased delays would still occur during project construction, even with mitigation. Given the lack of certainty about the timing (and identification) of other projects, specifically what projects would be constructed during construction of the project alternatives (2012-2015+), it is prudent to conclude that significant cumulative traffic and circulation impacts could occur and that impacts would be significant.

Mitigation Measure

Measure 4.9.4: Prior to construction, CCWD will coordinate with the appropriate local government departments in Brentwood, Contra Costa County, Alameda County, and Caltrans, and with utility districts and agencies regarding the timing of construction projects that would occur near project sites. Specific measures to mitigate potential significant impacts will be determined as part of the interagency coordination, and could include measures such as employing flaggers during key construction periods, designating alternate haul routes, and providing more outreach and community noticing.

Impact Significance after Mitigation: Less than Significant.

4.10 Air Quality

This section describes existing air quality within the project area and surrounding region, describes the associated regulatory framework, presents an analysis of potential impacts on air quality that would result from implementation of the proposed project and alternatives, and identifies mitigation measures.

4.10.1 Affected Environment

Because the project alternatives are all located within the same air basin, the air quality setting is identical for all alternatives. The affected environment section describes the regulatory setting and the existing air quality conditions in the project area.

Regulatory Setting

Air quality management exists at federal, state, and local levels of government. Air quality planning programs have generally been developed in response to requirements established by the federal Clean Air Act (CAA) of 1972 and subsequent amendments to the act; however, the enactment of the California Clean Air Act (CCAA) of 1988 produced additional changes in the structure and administration of air quality management programs in California.

Federal

The federal CAA requires the U.S. Environmental Protection Agency (EPA) to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. National standards have been established for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, respirable particulate matter (PM10 and PM2.5[1]), and lead. These pollutants are called "criteria" air pollutants because standards have been established for each of them to meet the specific public health and welfare criteria set forth in the CAA. California has adopted more stringent ambient air quality standards for the criteria air pollutants (referred to as California Ambient Air Quality Standards [CAAQS], or state standards) and has adopted air quality standards for some pollutants for which there is no corresponding national standard. **Table 4.10-1** provides a brief discussion of the related health effects and principal sources for each criteria air pollutant. **Table 4.10-2** presents current national and state ambient air quality standards and attainment status(es). Currently, there are no federal or state ambient air quality standards for any of the six greenhouse gases.[2]

The 1977 amendments to the CAA required the U.S. EPA to identify National Emission Standards for Hazardous Air Pollutants to protect public health and welfare. These substances include certain volatile organic chemicals, pesticides, herbicides, and radionuclides that present a tangible hazard, based on scientific studies of exposure to humans and other mammals. Control of HAPs (known as Toxic Air Contaminants (TACs) under California regulations) is achieved through federal, state and local controls on individual sources.

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1 PM10 and PM2.5 consist of particulate matter that is 10 microns (a micron is one-millionth of a meter) or less in diameter and 2.5 microns or less in diameter, respectively.

2 The six greenhouse gases are CO_2, methane, (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

TABLE 4.10-1
STATE AND FEDERAL CRITERIA AIR POLLUTANT SOURCES AND HEALTH EFFECTS

Pollutant	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Formed when reactive organic gases (ROG) and nitrogen oxides (NOx) react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial / industrial mobile equipment.
Carbon Monoxide	Classified as a chemical asphyxiant, carbon monoxide interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
Nitrogen Dioxide	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads.
Sulfur Dioxide	Irritates upper respiratory tract; injurious to lung tissue. Can yellow the leaves of plants, and is destructive to marble, iron, and steel. Limits visibility and reduces sunlight.	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
Respirable Particulate Matter (PM10)	May irritate eyes and respiratory tract, decrease lung capacity, and cause cancer and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays).
Fine Particulate Matter (PM2.5)	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and results in surface soiling.	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; Also, formed from photochemical reactions of other pollutants, including NOx, sulfur oxides, and organics.
Lead	Disturbs gastrointestinal system and causes anemia, kidney disease, and neuromuscular and neurological dysfunction.	Present source: lead smelters, battery manufacturing, and recycling facilities. Past source: combustion of leaded gasoline.
Hydrogen Sulfide	Nuisance odor (rotten egg smell), headache and breathing difficulties (higher concentrations)	Geothermal Power Plants, Petroleum Production and refining
Sulfates	Breathing difficulties, aggravates asthma, reduced visibility	Produced by the reaction in the air of SO2.
Visibility Reducing Particles	Reduces visibility, reduced airport safety, lower real estate value, discourages tourism.	See PM2.5.

SOURCE: CARB, 2005a.

TABLE 4.10-2
STATE AND FEDERAL CRITERIA AIR POLLUTANT STANDARDS

Pollutant	Averaging Time	California Standards[a]		National Standards[b]	
		Concentration	Attainment Status	Concentration[c]	Attainment Status
Ozone	1 hour	0.09 ppm	N	–	–[d]
	8 hours	0.070 ppm	N[e]	0.075 ppm	N[f]
Carbon Monoxide	1 hour	20 ppm	A	35 ppm	A
	8 hours	9.0 ppm	A	9 ppm	A[g]
Nitrogen Dioxide	1 hour	0.18 ppm	A	–	–
	Annual Avg.	0.030 ppm	–	0.053 ppm	A
Sulfur Dioxide	1 hour	0.25 ppm	A	–	–
	24 hours	0.04 ppm	A	0.14 ppm	A
	Annual Avg.	–	–	0.03 ppm	A
Respirable Particulate Matter (PM10)	24 hours	50 $\mu g/m^3$	N	150 $\mu g/m^3$	U
	Annual Avg.	20 $\mu g/m^3$	N[h]	–	A
Fine Particulate Matter (PM2.5)	24 hours	–	–	35 $\mu g/m^3$	U[i]
	Annual Avg.	12 $\mu g/m^3$	N[h]	15 $\mu g/m^3$	A
Lead	Monthly	1.5 $\mu g/m^3$	A	–	–
	Quarterly	–	–	1.5 $\mu g/m^3$	A
Hydrogen Sulfide	1 hour	0.03 ppm	U	–	–
Sulfates	24 hour	25 $\mu g/m^3$	A	–	–
Vinyl Chloride	24 hour	0.010 ppm	–	–	–
Visibility-Reducing Particles	8 hour	–[j]	A	–	–

A=Attainment N=Nonattainment U=Unclassified
mg/m^3=milligrams per cubic meter
ppm=parts per million
$\mu g/m^3$=micrograms per cubic meter

[a] California standards for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM10, and visibility-reducing particles are values that are not to be exceeded. The standards for sulfates, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour or 24-hour average (i.e., all standards except for lead and the PM10 annual standard), then some measurements may be excluded. In particular, measurements are excluded that CARB determines would occur less than once per year on the average.

[b] National standards other than for ozone, particulates, and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the fourth highest daily concentrations is 0.08 ppm or less. The 24-hour PM10 standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 $\mu g/m^3$. The 24-hour PM2.5 standard is attained when the 3-year average of 98th percentiles is less than 65 $\mu g/m^3$. Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM10 is met if the 3-year average falls below the standard at every site. The annual PM2.5 standard is met if the 3-year average of annual averages spatially-averaged across officially designed clusters of sites falls below the standard.

[c] National air quality standards are set at levels determined to be protective of public health with an adequate margin of safety. Each state must attain these standards no later than three years after that state's implementation plan is approved by the U.S. EPA.

[d] The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

[e] This standard was approved by the CARB on April 28, 2005, and became effective on May 17, 2006.

[f] In June 2004, the Bay Area was designated as a marginal nonattainment area of the national 8-hour ozone standard. US EPA lowered the national 8-hour ozone standard from 0.80 to 0.75 PPM (i.e., 75 ppb) effective May 27, 2008. EPA will issue final designations based upon the new 0.75 ppm ozone standard by March 2010.

[g] In April 1998, the Bay Area was redesignated to attainment for the national 8-hour carbon monoxide standard.

[h] In June 2002, CARB established new annual standards for PM2.5 and PM10.

[i] U.S. EPA lowered the 24-hour PM2.5 standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ in 2006. EPA has not yet determined the attainment status of BAAQMD for the new standard.

[j] Statewide Visibility-Reducing Particle Standard: Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

SOURCE: BAAQMD, 2008.

Federal Attainment Status

Pursuant to the 1990 federal CAA amendments, the U.S. EPA classifies air basins (or portions thereof) as "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the national standards have been achieved. Los Vaqueros Reservoir is located in Contra Costa County and is within the boundaries of the San Francisco Bay Area Air Basin. The Bay Area is in attainment or unclassified for all federal criteria pollutant standards, except for the 8-hour ozone standard, which is classified as marginal nonattainment for the national standard. "Unclassified" is defined in the CAA Amendments as any area that cannot be classified on the basis of available information as meeting or not meeting the national primary and secondary air quality standard for the specified pollutant.

Federal Conformity Requirements

Federal projects are subject to either the Transportation Conformity Rule (40 Code of Federal Regulations [CFR], Part 51, Subpart T), which applies to federal highway and transit projects, or the General Conformity Rule (40 CFR, Part 51, Subpart W), which applies to all other federal projects. Because the proposed project and alternatives are not a federal highway or transit project, it is subject to the General Conformity Rule.

The purpose of the General Conformity Rule is to ensure that federal projects conform to applicable state implementation plans (SIPs) so that they do not interfere with strategies employed to attain the National Ambient Air Quality Standards (NAAQS). The rule applies to federal projects in nonattainment areas for any of six criteria pollutants for which the U.S. EPA has established these national standards and in areas designated as "maintenance" areas (an area with a maintenance plan, which is a revision to the applicable SIP, meeting the requirements of section 175A of the CAA). The rule covers direct and indirect emissions of criteria pollutants or their precursors that result from a federal project, are reasonably foreseeable, and can be practicably controlled by the federal agency through its continuing program responsibility. The rule applies to all federal projects, including project approvals, and funding, except:

- Projects specifically included in a transportation plan or program that is found to conform under the federal transportation conformity rule
- Projects with associated emissions below specified "*de minimis*" threshold levels (i.e., levels beyond which an air quality effect is considered significant)
- Certain other projects that are exempt or presumed to conform, listed in 40 CFR, Part 51, Subpart W.

Sources that are exempt include those that require a permit under the New Source Review or Prevention of Significant Deterioration program. Projects presumed to conform are those that are presumed to result in insignificant quantities of emissions, including routine maintenance and repair, routine operations, and prescribed burning.

The San Francisco Bay Area, including the project study area, is in marginal nonattainment of the federal 8-hour ozone standard and moderate maintenance of the federal carbon monoxide standard. The applicable *de minimis* thresholds are 100 tons per year of ROG, NOx, and carbon monoxide. If the project would result in total direct and indirect emissions in excess of the *de minimis* emission rates, it must be demonstrated through conformity determination procedures that the emissions conform to the applicable SIP for each affected pollutant.

A federal project that does not exceed the *de minimis* threshold rates may still be subject to a general conformity determination if the sum of direct and indirect emissions would exceed 10 percent of the emissions of the nonattainment or maintenance area. If emissions would exceed 10 percent, the federal project is considered “regionally significant,” and thus general conformity rules apply. This allows regulatory agencies to address those federal projects that would not exceed the *de minimis* levels but would have the potential to adversely affect the air quality of a region. If the emissions would not exceed the *de minimis* levels and are not regionally significant, then the project is assumed to conform, and no further analysis or determination is required.

State

The California Air Resources Board (CARB) manages air quality, regulates mobile emissions sources, and oversees the activities of county and regional air pollution control districts and air quality management districts. CARB regulates local air quality indirectly by establishing state ambient air quality standards and vehicle emissions and fuel standards and by conducting research, planning, and coordinating activities.

The CAA requires each state to prepare a SIP, a planning document containing emission inventories, emission standards for motor vehicles and consumer products, and attainment plans adopted by local districts and approved by CARB for inclusion in the SIP. The U.S. EPA must review each SIP to determine its compliance with the federal CAA and air quality standards. Amendments to the CAA further require states containing areas that are in nonattainment for NAAQS to amend their SIPs to add additional control measures. Although the state prepares the majority of the SIP, local districts are responsible for adopting air quality attainment plans that are included in the SIP. Each attainment plan must demonstrate its compliance with the CAA and CCAA air quality standards.

Pursuant to Section 39606(b) of the California Health and Safety Code, California has adopted ambient standards that are more stringent than the national standards for some criteria air pollutants (e.g., PM10 daily and annual average standards). In July 2003, CARB’s new annual standards for PM10 and PM2.5 took effect. The annual PM10 standard was revised from 30 to 20 micrograms per cubic meter ($\mu g/m^3$), and the annual PM2.5 standard was revised from 15 to 12 $\mu g/m^3$. The state standards are shown in Table 4.10-2.

Toxic Air Contaminants

California law defines TACs as air pollutants having carcinogenic effects. The State Air Toxics Program was established in 1983 under Assembly Bill (AB) 1807. A total of 243 substances have been designated as TACs under California law; they include the 189 federal HAPs adopted in accordance with AB 2728. The Air Toxics “Hot Spots” Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources; AB 2588 does not regulate air toxics emissions.

Diesel Particulate Emissions

In August of 1998, CARB identified particulate emissions from diesel-fueled engines (diesel particulate matter, or DPM) as TACs. In 2000, CARB developed the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (CARB, 2000). The document represents a proposal to reduce diesel particulate emissions, with the goal of reducing emissions and the associated health risk by 75 percent in 2010 and by 85 percent in 2020. The program aims to require the use of state-of-the-art catalyzed diesel particulate filters and ultra-low sulfur diesel fuel on diesel-fueled engines. CARB regulations and programs that have been implemented to achieve these goals and that would apply to the project include the following (CARB, 2004):

- **Cleaner Diesel Fuel:** In 2003, the CARB adopted a new regulation lowering the sulfur content of diesel fuel to enable the use of advanced emission control technologies for diesel engines.

- **Standards for New On-Road Diesel Engines:** In 2001, CARB adopted new particulate matter (PM) and NOx emission standards to clean up large diesel engines that power big-rig trucks, trash trucks, delivery vans, and other large vehicles. These standards took effect in 2007 and will reduce DPM emissions by over 90 percent compared with new on-road engines previously sold in California.

- **Standards for New Off-Road Diesel Engines:** In 2004, CARB adopted a new off-road diesel engine emission standards (Tier 4) nearly identical to those adopted by the U.S EPA on May 11, 2004 under the Clean Air Nonroad Diesel Rule. These standards will reduce DPM emission by over 90 percent compared with new off-road engines currently sold in California. New engine standards take effect, based on engine horsepower, starting in 2008. In conjunction, sulfur levels will be reduced in nonroad diesel fuel by 99 percent from current levels by the year 2010.

- **New Regulations for In-Use Diesel Engines:**

  - *Stationary Engines Standards (adopted 2004)***:** Most stationary diesel-fueled engines in California are used as emergency backup in the event of a power failure. Others are used to pump water in some areas, to run compressors, and to operate other equipment. CARB standards for these engines will bring an approximate 80 percent PM reduction by 2020 through stricter standards for new engines and requirements to retrofit existing engines.

  - *Portable Engines Standards (adopted 2004):* Most portable diesel engines in California are used to power pumps, airport ground support equipment, oil drilling rigs, generators, and a variety of other equipment. CARB's rule requires four stepped reductions in emissions from portable engines, reaching a 95 percent reduction in PM emissions in 2020 with concurrent significant cuts in smog-forming emissions.

- **Carl Moyer Incentive Program:** The Carl Moyer Program was established in 1999 to offer monetary incentives to reduce NOx emissions from diesel engines. These increases in emissions from electricity use would be minimized by implementing the project design features discussed below.

CARB Handbook

CARB recently published the *Air Quality and Land Use Handbook: A Community Health Perspective* (CARB, 2005b). The primary goal in developing the handbook was to provide information that will help keep California's children and other vulnerable populations out of harm's way with respect to nearby sources of air pollution. The handbook highlights recent studies that have shown that public exposure to air pollution can be substantially elevated near freeways and certain other facilities. However, the health risk is greatly reduced with distance. For that reason, CARB provided some general recommendations aimed at keeping appropriate distances between sources of air pollution and sensitive land uses, such as residences. The project would not conflict with any of the general recommendations.

State Attainment Status

Under the CCAA, which has been patterned after the federal CAA, areas are designated as attainment or nonattainment with respect to the state standards. The Bay Area is designated as nonattainment for state ozone, PM10, and PM2.5 standards (BAAQMD, 2008). The Bay Area is designated as attainment for all other criteria pollutants.

AB 32, Reduction of Greenhouse Gases

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger issued Executive Order S-3-05, which sets forth a series of target dates by which statewide emission of greenhouse gases would be progressively reduced, as follows:

- By 2010, reduce greenhouse gas emissions to 2000 levels
- By 2020, reduce greenhouse gas emissions to 1990 levels
- By 2050, reduce greenhouse gas emissions to 80 percent below 1990 levels

In 2006, California passed the California Global Warming Solutions Act of 2006 (AB 32; California Health and Safety Code Division 25.5, Sections 38500, et seq.), which requires CARB to design and implement emission limits, regulations, and other measures, such that feasible and cost-effective statewide greenhouse gas emissions are reduced to 1990 levels by 2020 (representing an approximate 25 percent reduction in emissions).

In June 2007, CARB directed staff to pursue 37 early actions for reducing greenhouse gas emissions under the California Global Warming Solutions Act. The broad spectrum of strategies to be developed—including a Low Carbon Fuel Standard, regulations for refrigerants with high global warming potentials, guidance and protocols for local governments to facilitate greenhouse gas reductions, and green ports (provide an alternative source of power for ships while they are docked)—reflects that the serious threat of climate change requires action as soon as possible (CARB, 2007a). In addition to approving the 37 greenhouse gas reduction strategies, CARB directed staff to further evaluate early action recommendations made at the June 2007 meeting, and to report back to CARB within six months. The general sentiment of CARB suggested a desire to try to pursue greater greenhouse gas emissions reductions in California in the near-term. Since the June 2007 CARB hearing, CARB staff has evaluated all 48 recommendations submitted by several stakeholder and several internally-generated staff ideas and published the *Expanded List of Early Action Measures To Reduce Greenhouse Gas Emissions In California Recommended For Board Consideration* in October 2007 (CARB, 2007b). Based on its additional analysis, CARB staff is recommending the expansion of the early action list to a total of 44 measures, which are presented in **Table 4.10-3**. The measures that are applicable to the proposed project and alternatives are highlighted. As indicated, most of these measures are not applicable to a project but five measures could be applicable. These measures include (1) above ground storage tanks for fuels (during proposed project construction activities); (2) non-agricultural diesel off-road equipment (during proposed project construction activities); (3) privately owned on-road diesel trucks (primarily during proposed project construction activities); (4) anti-idling enforcement of heavy trucks (during proposed project construction activities); and (5) tire inflation program (during proposed project construction and operational activities).

In December 2007, CARB approved the 2020 emission limit of 427 million metric tons of CO_2 equivalents of greenhouse gases. The 2020 target of 427 million metric tons of CO_2 equivalent (CO_2E) requires the reduction of 169 million metric tons of CO_2E, or approximately 30 percent, from the state's projected 2020 emissions of 596 million metric tons of CO_2E (business-as-usual).

Also in December 2007, CARB adopted mandatory reporting and verification regulations pursuant to AB 32. The regulations will become effective January 1, 2009, with the first reports covering 2008 emissions. The mandatory reporting regulations require reporting for certain types of facilities that make up the bulk of the stationary source emissions in California. Currently, the draft regulation language identifies major facilities as those that generate more than 25,000 metric tons/year of CO_2E. Cement plants, oil refineries, electric-generating facilities/providers, cogeneration facilities, and hydrogen plants and other stationary combustion sources that emit more than 25,000 metric tons/year CO_2E, make up 94 percent of the point source CO_2E emissions in California (CARB, 2007c).

In June, 2008, CARB published its Climate Change Draft Scoping Plan. The Draft Scoping Plan reported that CARB met the first milestones set by AB 32 in 2007: developing a list of early actions to begin sharply reducing greenhouse gas emissions; assembling an inventory of historic emissions; and establishing the 2020 emissions limit. After consideration of public comment and further analysis, CARB released the Climate Change Proposed Scoping Plan in October, 2008. The Proposed Scoping Plan proposes a comprehensive set of actions designed to reduce overall carbon emissions in California. Key elements of the Proposed Scoping Plan include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;
- Achieving a statewide renewables energy mix of 33 percent;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;

TABLE 4.10-3
CARB RECOMMENDED AB32 GREENHOUSE GAS MEASURES TO BE INITIATED BY CARB BETWEEN 2007 AND 2012

ID #	Sector	Strategy Name	ID #	Sector	Strategy Name
1	Fuels	Above Ground Storage Tanks	23	Commercial	SF_6 reductions from the non-electric sector
2	Transportation	Diesel – Offroad equipment (non-agricultural)	24	Transportation	Tire inflation program
3	Forestry	Forestry protocol endorsement	25	Transportation	Cool automobile paints
4	Transportation	Diesel – Port trucks	26	Cement	Cement (A): Blended cements
5	Transportation	Diesel – Vessel main engine fuel specifications	27	Cement	Cement (B): Energy efficiency of California cement facilities
6	Transportation	Diesel – Commercial harbor craft	28	Transportation	Ban on HFC release from Motor Vehicle AC service / dismantling
7	Transportation	Green ports	29	Transportation	Diesel – offroad equipment (agricultural)
8	Agriculture	Manure management (methane digester protocol)	30	Transportation	Add AC leak tightness test and repair to Smog Check
9	Education	Local gov. Greenhouse Gas (GHG) reduction guidance / protocols	31	Agriculture	Research on GHG reductions from nitrogen land applications
10	Education	Business GHG reduction guidance / protocols	32	Commercial	Specifications for commercial refrigeration
11	Energy Efficiency	Cool communities program	33	Oil and Gas	Reduction in venting / leaks from oil and gas systems
12	Commercial	Reduce high Global Warming Potential (GWP) GHGs in products	34	Transportation	Requirement of low-GWP GHGs for new Motor Vehicle ACs
13	Commercial	Reduction of PFCs from semiconductor industry	35	Transportation	Hybridization of medium and heavy-duty diesel vehicles
14	Transportation	SmartWay truck efficiency	36	Electricity	Reduction of SF_6 in electricity generation
15	Transportation	Low Carbon Fuel Standard (LCFS)	37	Commercial	High GWP refrigerant tracking, reporting and recovery program
16	Transportation	Reduction of HFC-134a from DIY Motor Vehicle AC servicing	38	Commercial	Foam recovery / destruction program
17	Waste	Improved landfill gas capture	39	Fire Suppression	Alternative suppressants in fire protection systems
18	Fuels	Gasoline disperser hose replacement	40	Transportation	Strengthen light-duty vehicle standards
19	Flues	Portable outboard marine tanks	41	Transportation	Truck stop electrification with incentives for truckers
20	Transportation	Standards for off-cycle driving conditions	42	Transportation	Diesel – Vessel speed reductions
21	Transportation	Diesel – Privately owned on-road trucks	43	Transportation	Transportation refrigeration – electric standby
22	Transportation	Anti-idling enforcement	44	Agriculture	Electrification of stationary agricultural engines

NOTE: Highlighted measures would be applicable to the proposed project.

SOURCE: CARB, 2007a.

- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and

- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state's long-term commitment to AB 32 implementation. (CARB, 2008)

The Proposed Scoping Plan notes that "[a]fter Board approval of this plan, the measures in it will be developed and adopted through the normal rulemaking process, with public input" (CARB, 2008).

The Proposed Scoping Plan states that local governments are "essential partners" in the effort to reduce greenhouse gas emissions, and that they have "broad influence and, in some cases, exclusive jurisdiction" over activities that contribute to greenhouse gas emissions. It encourages local governments to reduce greenhouse gas emissions by approximately 15 percent from current levels by 2020 (CARB, 2008).

Senate Bill 97

The provisions of Senate Bill 97, enacted in August 2007 as part of the State Budget negotiations, direct the Office of Planning and Research (OPR) to propose CEQA Guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions." SB 97 directs OPR to develop such guidelines by July 2009, and directs the State Resources Agency, the agency charged with adopting the CEQA Guidelines, to certify and adopt such guidelines by January 2010.

OPR Technical Advisory, CEQA and Climate Change

On June 19, 2008, OPR published a technical advisory on CEQA and Climate Change (OPR, 2008). The technical advisory is one in a series of advisories published by OPR as a service to professional planners, land use officials and CEQA practitioners. The advisory provides OPR's perspective on the emerging role of CEQA in addressing climate change and greenhouse gas emissions, while recognizing that approaches and methodologies for calculating greenhouse gas emissions and addressing environmental impacts through CEQA review are rapidly evolving. The advisory recognizes that OPR will develop, and the Resources Agency will adopt amendments to the CEQA Guidelines pursuant to SB 97. In the interim, the technical advisory "offers informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents" (OPR, 2008).

The technical advisory points out that neither CEQA nor the CEQA Guidelines prescribe thresholds of significance or particular methodologies for performing an impact analysis. "This is left to lead agency judgment and discretion, based upon factual data and guidance from regulatory agencies and other sources where available and applicable" (OPR, 2008). OPR recommends that "the global nature of climate change warrants investigation of a statewide threshold of significance for GHG emissions" (OPR, 2008). Until such a standard is established, OPR advises that each lead agency should develop its own approach to performing an analysis for projects that generate greenhouse gas emissions (OPR, 2008).

OPR sets out the following process for evaluating greenhouse gas emissions. First, agencies should determine whether greenhouse gas emissions may be generated by a proposed project, and if so, quantify or estimate the emissions by type or source. Calculation, modeling or estimation of greenhouse gas emissions should include the emissions associated with vehicular traffic, energy consumption, water usage and construction activities (OPR, 2008).

Agencies should then assess whether the emissions are "cumulatively considerable" even though a project's greenhouse gas emissions may be individually limited. OPR states: "Although climate change is ultimately a cumulative impact, not every individual project that emits GHGs must necessarily be found to contribute to a significant cumulative impact on the environment" (OPR, 2008). Individual lead agencies may undertake a project-by-project analysis, consistent with available guidance and current CEQA practice (OPR, 2008).

Finally, if the lead agency determines emissions are a cumulatively considerable contribution to a significant cumulative impact, the lead agency must investigate and implement ways to mitigate the emissions (OPR, 2008). OPR states: "Mitigation measures will vary with the type of project being contemplated, but may include alternative project designs or locations that conserve energy and water, measures that reduce vehicle miles traveled (VMT) by fossil-fueled vehicles, measures that contribute to established regional or programmatic mitigation strategies, and measures that sequester carbon to offset the emissions from the project" (OPR, 2008). OPR concludes that "A lead agency is not responsible for wholly eliminating all GHG emissions from a project; the CEQA standard is to mitigate to a level that is "less than significant" (OPR, 2008). The technical advisory includes a list of mitigation measures that can be applied on a project-by-project basis.

Chapter 5.0 discusses the environmental effects of climate change, including potential climate change effects with respect to water supply and water resources. Chapter 5.0 also provides extensive background information on the relationship between emissions of greenhouse gases and climate change.

Local

Bay Area Air Quality Management District

The regional and county air districts are primarily responsible for developing local air quality plans and regulating stationary emissions sources and facilities. The project area lies within the jurisdiction of the BAAQMD. As noted earlier, the federal CAA and the state CCAA require plans to be developed for areas designated as nonattainment (with the exception of areas designated as nonattainment for the state PM10 standard). Plans are also required under federal law for areas designated as "maintenance" for national standards. Such plans are to include strategies for attaining the standards.

Currently, there are two plans for the Bay Area: the *San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard* (BAAQMD, 2001), which was developed to meet federal ozone air quality planning requirements, and the *Bay Area 2005 Ozone Strategy* (BAAQMD, 2006a), which was developed to meet planning requirements related to the state ozone standard. These attainment plans depend on BAAQMD's permit authority, which is exercised through

BAAQMD's *Rules and Regulations.* Both federal and state ozone plans rely predominantly on stationary source control measures. In contrast to the ozone plans, the *Carbon Monoxide Maintenance Plan* relies on mobile source control measures.

With respect to the construction phase of the project, applicable BAAQMD regulations would relate to portable equipment (e.g., gasoline- or diesel-powered engines used for power generation, pumps, compressors, pile drivers, and cranes), architectural coatings, and paving materials. Equipment used during project construction would be subject to the requirements of BAAQMD Regulation 2 (Permits), Rule 1 (General Requirements) with respect to portable equipment unless exempt under Rule 2-1-105 (Exemption, Registered Statewide Portable Equipment); BAAQMD Regulation 8 (Organic Compounds), Rule 3 (Architectural Coatings) and Rule 15 (Emulsified and Liquid Asphalts).

Contra Costa County General Plan

The Conservation Element of the Contra Costa County General Plan (Contra Costa County, 2005) contains air quality goals and policies. These goals and policies include meeting Federal Air Quality Standards for all air pollutants (Goal 8-AA); reducing air pollution in order to protect human and environmental health (Goal 8-AB); and implementing mitigation measures when a proposed project could result in significant impacts to air quality (8-103) (Contra Costa County, 2005). A list of all the goals and policies related to air quality are listed in Appendix E.

Alameda County East County Area Plan – A Portion of the Alameda County General Plan

Alameda County's East County Area Plan (ECAP) also contains goals and policies relevant to the planning and management of air quality. Specifically, the policies in the ECAP include: meeting federal and state air quality standards for local air pollutants of concern (Policy 291); coordination of incorporation of air quality mitigations in the design of large projects that could generate high levels of air pollutants (Policy 299); and review for projects' potential to generate hazardous air pollutants (Policy 300) (East County Area Plan, 2000). These goals and policies are listed in Appendix E.

Regional Setting – General Climate and Meteorology

Emissions from any one project or region would not cause global climate change itself. For greenhouse gases, emissions from all sources on a global scale contribute to the cumulative climate change impact.

Other air pollutants are considered regional in nature, some are considered local, and some have characteristics that are both regional and local. Air pollutants are also characterized as "primary" and "secondary" pollutants. Primary pollutants are those emitted directly into the atmosphere (such as carbon monoxide, sulfur dioxide, lead particulates, and hydrogen sulfide). Secondary pollutants are those formed through chemical reactions in the atmosphere; these chemical reactions usually involve primary pollutants, normal constituents of the atmosphere, and other secondary pollutants. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) compounds and nitrogen oxides (NOx). ROG and NOx are known as precursor compounds for ozone. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production. In regards to regional emissions, regional air quality is affected by the rate, amount, and location of pollutant emissions and the associated meteorological conditions that influence pollutant movement and dispersal. Atmospheric conditions (for example, wind speed, wind direction, and air temperature) in combination with local surface topography (for example, geographic features such as mountains and valleys), determine how air pollutant emissions affect regional air quality. Localized emissions are typically analyzed with regards to exposure of specific sensitive receptors to pollutant concentrations (i.e., CO hotspots and TAC health risk). Ambient CO concentrations, for example, are normally considered a local effect and typically correspond closely to the spatial and temporal distributions of vehicular traffic. Wind speed and atmospheric mixing also influence CO concentrations. Under inversion conditions, CO concentrations may be distributed more uniformly over an area out to some distance from vehicular sources.

The project sites lie within the San Francisco Bay Area (Bay Area) Air Basin, which encompasses a nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin, and Napa Counties and the southern portions of Solano and Sonoma Counties. The climate of the Bay Area is determined largely by a high-pressure system that is almost always present over the eastern Pacific Ocean off the West Coast of North America. High-pressure systems are characterized by an upper layer of dry air that warms as it descends, which restricts the mobility of cooler marine-influenced air near the ground surface and results in the formation of subsidence inversions. During the winter, the Pacific high-pressure system shifts southward, thereby allowing storms to pass through the region. During summer and fall, emissions generated within the Bay Area can combine with abundant sunshine under the restraining influences of topography and subsidence inversions to create conditions that are conducive to the formation of photochemical pollutants, such as ozone.

The eastern portions of Contra Costa County are generally well ventilated by winds flowing through the Carquinez Straits and Delta. Terrain does not restrict ventilation, but temperatures are quite warm, which promotes the formation of ozone (BAAQMD, 1999).

Existing Air Quality

The Los Vaqueros Reservoir Expansion Project components would be located primarily in eastern Contra Costa County, although a portion of the Transfer-Bethany Pipeline would be located in Alameda County. The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network that measures the ambient concentrations of the six criteria pollutants (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, respirable particulate matter [(PM10 and PM2.5)], and lead). Existing air quality in the Bay Area can generally be inferred from ambient air quality measurements conducted by the BAAQMD at its monitoring stations. The major pollutants of concern in the Bay Area—ozone, particulate matter, and carbon monoxide—are monitored at a number of locations. The monitoring station closest to the project area is on Rincon Avenue in Livermore, approximately eight miles from Los Vaqueros Reservoir. **Table 4.10-4** shows a five-

TABLE 4.10-4
AIR QUALITY DATA SUMMARY (2002–2006) FOR THE PROJECT AREA

Pollutant	Standard[a]	Monitoring Data by Year				
		2002	2003	2004	2005	2006
Ozone: Rincon Avenue, Livermore						
Highest 1-Hour Average (ppm)[b]	0.09	**0.160**	**0.128**	**0.113**	**0.120**	**0.127**
Days over State Standard		10	10	5	6	13
Highest 8-Hour Average (ppm)[b]	0.08	**0.106**	**0.094**	0.080	**0.090**	**0.101**
Days over National Standard		6	3	0	1	5
Carbon Monoxide: Rincon Avenue, Livermore						
Highest 8-Hour Average (ppm)[b]	9	2.50	1.94	1.81	1.79	1.53
Days over State Standard		0	0	0	0	0
Days over National Standard		0	0	0	0	0
Particulate Matter (PM10): Rincon Avenue, Livermore						
Highest 24-Hour Average (μg/m³)[b] – State Measurement[c]	50	**65.9**	32.7	48.8	49.4	**69.2**
Est. Days over State Standard		12.3	0	0	0	17.3
Highest 24-Hour Average (μg/m³)[b] – National Measurement[c]	150	63.5	31.5	46.7	48.3	67.8
Est. Days over Nat. Standard		0	0	0	0	0
State Annual Average (μg/m³)[b]	20	**25.0**	18.9	20.0	18.8	**21.8**
Particulate Matter (PM2.5): Rincon Avenue, Livermore						
Highest 24-Hour Average (μg/m³)[b]	35	61.6	42.0	40.8	32.1	50.8
Days over National Standard[d]		0	0	0	0	0
National Annual Average (μg/m³)[b]	12	**13.8**	9.0	10.2	9.0	9.8

a Generally, state standards and national standards are not to be exceeded more than once per year.
b ppm = parts per million; μg/m3 = micrograms per cubic meter.
c PM10 is not measured every day of the year. Number of estimated days over the standard is based on 365 days per year.
d U.S EPA lowered the 24-hour PM2.5 standard from 65 μg/m3 to 35 μg/m3 in 2006. The CARB website compares monitoring data for these years to the previous PM2.5 standard of 65 μg/m3.

NOTES: Values in bold are in excess of at least one applicable standard. NA = Not Available.

SOURCE: CARB, 2007d.

year summary of ozone, carbon monoxide, and particulate matter monitoring data from the Rincon Avenue air quality station. The table also compares measured pollutant concentrations with state and federal ambient air quality standards.

Air Pollutants of Concern

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NOx). ROG and NOx are known as precursor compounds for ozone. Significant ozone production generally requires ozone precursors to be present in a stable atmosphere with strong sunlight for approximately three hours. Ozone is a regional air pollutant because it is not emitted directly by sources but is formed downwind of sources of ROG and NOx under the influence of wind and sunlight. Ozone concentrations tend to be higher in the late spring, summer, and fall, when the long sunny days combine with regional subsidence inversions to create conditions conducive to the formation and accumulation of secondary photochemical compounds, like ozone. On-road motor vehicles are the single largest source of ozone precursors in the Bay Area (BAAQMD, 1999).

Once formed, ozone remains in the atmosphere for one or two days. Ozone is then eliminated through chemical reaction with plants (reacts with chemicals on the leaves of plants), rainout (attaches to water droplets as they fall to earth), and washout (absorbed by water molecules in clouds and later falls to earth with rain). The Bay Area is designated as a nonattainment area for ozone, based on both national and state standards.

Carbon Monoxide

Carbon monoxide, a colorless and odorless gas, is a non-reactive pollutant that is a product of incomplete combustion and is mostly associated with motor vehicles. When inhaled at high concentrations, carbon monoxide combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

Table 4.10-4 shows that exceedances of ambient carbon monoxide standards have not occurred in the Rincon Avenue station area in the last five years. CO measurements and modeling were important in the early 1980's when CO levels were regularly exceeded throughout California. In more recent years, CO measurements and modeling have not been a priority in most California air districts due to the retirement of older polluting vehicles, less emissions from new vehicles and improvements in fuels. The clear success in reducing CO levels is evident in the first paragraph of the executive summary of the California Air Resources Board *2004 Revision to the California State Implementation Plan for Carbon Monoxide Updated Maintenance Plan for Ten Federal Planning Areas*, shown below:

> "The dramatic reduction in carbon monoxide (CO) levels across California is one of the biggest success stories in air pollution control. Air Resources Board (CARB or Board) requirements for cleaner vehicles, equipment and fuels have cut peak CO levels in half since 1980, despite growth. All areas of the State designated as non-attainment for the federal 8-hour CO standard in 1991 now attain the standard, including the Los Angeles urbanized area. Even the Calexico area of Imperial County on the congested Mexican border had no violations of the federal CO standard in 2003. Only the South Coast and Calexico continue to violate the more protective State 8-hour CO standard, with declining levels beginning to approach that standard."

Particulate Matter

PM10 and PM2.5 represent fractions of particulate matter that can be inhaled into the air passages and the lungs and that can cause adverse health effects. Particulate matter in the atmosphere results from many kinds of dust- and fume-producing industrial and agricultural operations, grading and construction, and motor vehicle use. Some sources of particulate matter, such as wood burning in fireplaces, demolition, and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Particulates also can damage materials and reduce visibility. Large dust particles (diameter greater than 10 microns) settle out rapidly and are easily filtered by human breathing passages. This large dust is of more concern as a soiling nuisance rather than a health hazard. The remaining fraction, PM10 and PM2.5, are a health concern particularly at levels above the federal and state ambient air quality standards. PM2.5 (including diesel exhaust particles) is thought to have greater effects on health, because these particles are so small and thus, are able to penetrate to the deepest parts of the lungs. Scientific studies have suggested links between fine particulate matter and numerous health problems including asthma, bronchitis, acute and chronic respiratory symptoms such as shortness of breath and painful breathing. Children are more susceptible to the health risks of PM2.5 because their immune and respiratory systems are still developing.

In the Bay Area, most particulate matter is emitted by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Motor vehicles constitute the single largest source of PM10 in the Bay Area (BAAQMD, 1999).

Greenhouse Gases

Gases that trap heat in the atmosphere are called greenhouse gases. Increases in greenhouse gases are causing global climate change. Global climate change is a change in the average weather on earth that can be measured by wind patterns, storms, precipitation, and temperature. Although there is disagreement as to the speed of global warming and the extent of the impacts attributable to human activities, most agree that there is a link between increased emission of greenhouse gases and long-term global temperature. What greenhouse gases have in common is that they allow sunlight to enter the atmosphere, but they also trap a portion of the outward-bound infrared radiation and warm up the air. The process is similar to the effect greenhouses have in raising their internal temperature, hence the name greenhouse gases. Both natural processes and human activities emit greenhouse gases.

The accumulation of greenhouse gases in the atmosphere regulates the earth's temperature; however, emissions from human activities such as electricity production and motor vehicles have elevated the concentration of greenhouse gases in the atmosphere. This accumulation of greenhouse gases has contributed to an increase in the temperature of the earth's atmosphere and contributed to global climate change. The principal greenhouse gases are carbon dioxide (CO_2), methane, nitrous oxide (N_2O), sulfur hexafluoride, perfluorocarbons, hydrofluorocarbons, and water vapor. Carbon dioxide is the reference gas for climate change. To account for the warming potential of greenhouse gases, and to combine emissions of gases with differing properties, greenhouse gas emissions are often quantified and reported as CO_2 equivalents (CO_2E).

The World Meteorological Organization (WMO) reported that since the start of the twentieth century, the global average surface temperature has risen between 0.6 degrees Celsius (°C) and 0.7°C (1.08 degrees Fahrenheit (°F) and 1.26°F). But this rise has not been continuous. Since 1976, global average temperature has risen sharply, at 0.18°C (0.32°F) per decade. In the northern and southern hemispheres, the 1990s were the warmest decade, with an average of 0.38°C (0.68°F) and 0.23°C (0.41°F) above the 30-year mean, respectively (WMO, 2005). The 10 warmest years for the earth's surface temperature all occurred after 1990 and the first or second warmest year on record appears to have occurred in 2005. Recent research suggests that warming occurring during the last four decades could be attributable to the increasing atmospheric concentrations of climate change emissions due to human activities (Cayan et al. 2006).

In California and throughout western North America, observations reveal trends in the past 50 years toward warmer winter and spring temperatures, a smaller fraction of precipitation falling as snow instead of rain (Knowles et al. 2006), a decrease in the amount of spring snow accumulation in lower and middle elevation mountain zones (Mote et al. 2005), and an advance in snowmelt of 5 to 30 days earlier in the spring (Stewart et al. 2005).

Climate variability and change would interact with other environmental stresses and socioeconomic changes. Chapter 5.0 discusses climate change effects with respect to water supply and water resources. Air and water pollution and management, habitat fragmentation, wetland loss, coastal erosion, and reduction in fisheries are likely to be compounded by climate-related stresses. An aging populace nationally, and rapidly growing populations in cities, coastal areas, and across the South and West are social factors that interact with and alter sensitivity to climate variability and change (NAST, 2000a). Water resources in the west are particularly susceptible to the impacts of climate change, especially for the West, Pacific Northwest, and Alaska. Reduced summer runoff, increased winter runoff, and increased demands are likely to compound current stresses on water supplies and flood management in the West (NAST, 2000b). Potential impacts are of special concern to regions like California (Kiparsky and Gleick 2003).

A GHG inventory is an accounting of the amount of GHG emitted to or removed from the atmosphere over a specified period of time attributed to activities by a particular entity (e.g., annual emissions and reductions attributed to the State of California). In 2004, total worldwide GHG emissions were estimated to be 20,135 Teragrams[3] (Tg) CO_2E.[4] In 2006, GHG emissions in the U.S. were 7,054.2 Tg CO_2E, a 14.7 percent increase over 1990 emissions.[5] California is the second largest contributor of GHG emissions in the U.S. and the sixteenth largest in the world (CEC, 2006). In 2004, California produced 497 Tg CO_2E, which is approximately 7 percent of 2004 U.S. emissions and 2.4 percent of global emissions (CEC, 2006).

Toxic Air Contaminants

Non-criteria air pollutants, or toxic air contaminants (TACs), are airborne substances capable of causing short-term (acute) or long-term, chronic or carcinogenic (i.e., cancer-causing) illnesses. TACs include both organic and inorganic chemical substances. They may be emitted from a variety of common sources, including gasoline stations, automobiles, diesel engines, dry cleaners, industrial

3 1 teragram = 1 million metric tons

4 Intergovernmental Panel on Climate Change, 2007. R.B. Alley et al. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Summary for Policymakers.

5 U.S. Environmental Protection Agency (EPA). 2008. The U.S. Greenhouse Gas Emissions and Sinks: Fast Facts. Office of Atmospheric Programs.

operations, and painting operations. The issue of diesel particulate as a TAC is discussed above, under Regulatory Setting, State Regulations.

Sensitive Receptors

Some receptors are considered more sensitive than others to criteria air pollutants and hazardous air pollutants/toxic air contaminants. The reasons for greater than average sensitivity include preexisting health problems, proximity to the emission source, or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because children, elderly people, and the infirm are more susceptible to respiratory infections and other air quality-related health problems than the general public. Residential areas are also sensitive to poor air quality because people usually live in one place for extended periods of time.

There are no schools, hospitals, or convalescent homes near the proposed project facility sites. There are two residential communities near the project area: the Town of Discovery Bay and the Town of Byron. No project construction would occur in either of these communities, although project pipeline construction would occur in the roadway adjacent to Discovery Bay. Inside the project area, there is primarily low density, rural residential development. Following, for each alternative, is a list that summarizes the location and approximate number of residences near each proposed project area or facility site.

Alternative 1

Residential uses occur near the proposed facilities as follows:

- *Los Vaqueros Watershed* – reservoir expansion area, in-watershed facilities construction sites, borrow material and staging sites, and recreational facility sites – One residence off Los Vaqueros Road is about 2 miles south of the reservoir. There are also 12 residences on the ridge west of the watershed near Morgan Territory Road, about 1.6 miles from the reservoir and 3 miles from the reservoir dam site. In addition, there are several residences approximately 2.5 miles northeast of the expanded dam site, located off Silver Hills Drive near the north entrance to the watershed.

- *Delta Intake and Pump Station* – The closest sensitive land use to the existing Old River Intake and Pump Station is a house about 3,000 feet to the northwest along SR 4. The closest residence to the proposed new Delta Intake and Pump Station is a single farmhouse on the east side of Old River. Depending on the location selected for this facility it could be between 500 and 1,000 feet from this residence.

- *Delta-Transfer Pipeline* – Construction would occur along the south side of SR 4, as close as 50 feet from the town of Discovery Bay where as many as 120 residences are along the north side of SR 4 along the pipeline alignment. About 16 rural home sites lie within 50 feet of the 6.5-mile pipeline route as it passes along SR 4, Bixler Road, Kellogg Creek Road, and Hoffman Lane.

- *Transfer Facility Expansion* – The nearest residence to the Transfer Facility is along Walnut Avenue, about 1,450 feet west of the anticipated construction site.

- *Transfer-LV Pipeline* – About 5 rural residences along Camino Diablo and Walnut Avenue lie within 50 feet of the Transfer-LV Pipeline alignment.
- *Transfer-Bethany Pipeline* – An estimated 7 rural homesteads near Vasco Road or Armstrong Road lie as close as 50 feet from the Transfer-Bethany Pipeline alignment. The Bethany Reservoir State Recreation Area, with a bikeway along the California State Aqueduct, is along the pipeline alignment (Eastside Option) near the southern terminus of the pipeline. The project construction area at Bethany Reservoir for the tie-in is not accessible to the public and is over 300 feet from a public access area.
- *Power Option 1* – There would be no physical construction activity on the transmission line from Western's existing Tracy substation to the new substation in the project area. The existing Western transmission line would feed the new substation. The nearest rural residences are about 1,275 feet away from the new substation and upgraded transmission line to be extended from the new substation east to the new Delta Intake Pump Station. For the transmission line that would extend west to the Transfer Facility Expansion, the new 21 kV transmission line would be constructed along a portion of SR 4, in the same corridor as the Delta-Transfer Pipeline. An estimated 16 rural home sites lie within 50 feet of the proposed transmission lines.
- *Power Option 2* – Like Power Option 1, Power Option 2 would make use of Western's existing transmission line that extends northwest from it's existing Tracy substation; no facility changes or new construction would occur along this existing transmission line. The existing Western transmission line that extends east to service the Old River Pump Station would be upgraded but this option does not include a new Western sunstation. About 4 rural home sites are 1,275 feet or more from the Western transmission line proposed for upgrade. A new overhead transmission line would be extended from PG&E's existing facilities in Brentwood in the corridor as the proposed Transfer-LV Pipeline. About 5 rural residences along Camino Diablo Road and Walnut Avenue lie within 50 feet of the joint transition line and pipeline alignment. The new PG&E substation required under this option would be on CCWD property with the CCWD Los Vaqueros watershed. The nearest residence to this proposed substation lies within 500 feet and is off Silver Hills Drive.
- *Recreation Facilities* – The recreation facilities that would be replaced and expanded within the Los Vaqueros Watershed would be near and around the reservoir. The closest homes to the reservoir include 12 residences on the ridge west of the watershed near Morgan Territory Road, about 1.6 miles from the reservoir and 3 miles from the Marina Complex site. A single residence off Los Vaqueros Road to the south is located about 2 miles from the reservoir and 4.8 miles from the proposed Marina Complex. In addition, there are several residences approximately 2.5 miles northeast of the expanded dam site, located off Silver Hills Drive near the north entrance to the watershed.

Alternative 2

The sensitive receptors for localized air quality effects associated with Alternative 2 would be the same as those described above for Alternative 1 because Alternative 2 includes all the same proposed facilities and construction activities in the same locations.

Alternative 3

Sensitive receptors for Alternative 3 would be largely the same as those outlined for Alternative 1 with three substantive differences:

- The existing Old River Intake and Pump Station would be expanded under this alternative but not under Alternative 1. Construction activity to expand this facility would occur approximately 3,000 feet from the nearest residence located to the northwest along State Route (SR) 4 (see Figure 4.11-3).

- Alternative 3 would not include construction of a new Delta Intake so there would be no exposure of sensitive receptors to air pollutant emissions associated with this facility, as there would be under Alternative 1.

- Alternative 3 would not include the Transfer-Bethany pipeline, so there would be no exposure of sensitive receptors to air pollutant emissions associated with this facility.

The closest sensitive receptors to the remaining project components would be the same as described above for Alternative 1.

Alternative 4

Alternative 4 would include a dam raise for a 160 TAF reservoir that would be smaller and involve less construction material and construction activity than the dam raise required under Alternative 1 for the 275 TAF reservoir. Under Alternative 4, the closest sensitive receptors to the Expanded Los Vaqueros Reservoir Expansion/Dam Modification site include twelve residences on the ridge west of the watershed located near Morgan Territory Road, located approximately 1.6 miles from the Reservoir and 3 miles from the Marina Complex site. The closest sensitive receptor to the 160 TAF Reservoir Expansion borrow area is a residence located on the southeast corner of Camino Diablo and Walnut Boulevard, over 4,000 feet north of the 160 TAF borrow site.

Alternative 4 would not include expansion of the existing Old River Pump Station or construction of the new Delta Intake and Pump Station, any of the proposed conveyance facilities, or any new power supply facilities. Also, fewer recreation facilities would be relocated or expanded within CCWD watershed lands under Alternative 4 than under Alternative 1.

4.10.2 Environmental Consequences

Methodology

Project-related air quality impacts would fall into two categories: short-term, construction-related impacts and long-term, operations-related impacts. Short-term construction activities would primarily result in the generation of ROG, NOx, PM10 and GHGs from construction equipment. Long-term operational emission sources would result in nominal emissions associated with vehicle trips during routine inspection and maintenance of the project components and infrequent testing of emergency generators. In addition, the independent power plants and facilities that generate the electricity necessary to operate the expanded Los Vaqueros system facilities would emit pollutants, including GHGs.

For the evaluation of construction impacts associated with emissions of criteria pollutants, the BAAQMD does not require a detailed quantification of construction emissions. Instead, it recommends that evaluation of the significance of impacts be based on a consideration of the control measures to be implemented (BAAQMD, 1999). The BAAQMD CEQA Guidelines recognize that construction equipment emits ozone precursors, but indicate that such emissions are included in the emission inventory that is the basis for regional air quality plans. The guidelines note that during construction, PM10 is the pollutant of greatest concern and can potentially lead to adverse health effects as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces. Generally, if appropriate measures are implemented to reduce fugitive dust, then the residual impact can be presumed to be less-than-significant. Without these measures, the impact is generally considered to be significant, particularly if sensitive land uses (e.g., residential) are located in the project vicinity.

Because the proposed project and alternatives would be subject to the General Conformity Rule, construction emissions associated with the proposed project and alternatives were calculated. U.S. EPA's *de minimis* conformity thresholds also were used to determine the significance of criteria pollutants emitted during construction. As recommended by the BAAQMD, construction emissions (including CO_2) were calculated using the CARB OFFROAD2007 model for off-road equipment and the EMFAC2007 model for on-road workers and haul trucks (Vintze, 2005).

For GHG (CO_2E) quantification, the analysis uses OFFROAD2007 for construction activity emissions and Global Warming Potential emission factors from the *California Climate Action Registry General Reporting Protocol* (California Climate Action Registry, 2008), as well as existing and projected pumping rates, associated electrical demand, and power source carbon emissions information (for PG&E or Central Valley Project (CVP)/Modesto Irrigation District (MID)) for indirect electricity generation (CCWD, 2008). The approach to the GHG emissions analysis is discussed in more detailed in Impact 4.10.5, below.

Significance Criteria

For the purpose of this analysis, the following thresholds of significance have been applied. These thresholds are based on the BAAQMD CEQA Guidelines, the State CEQA Guidelines (Appendix G), and the lead agencies' judgment as to the criterion to address the greenhouse gas emissions associated with the proposed project. The thresholds described below also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. The project could have a significant effect if it would:

- Generate substantial criteria air pollutants during construction that would contribute to existing nonattainment conditions and further degrade air quality;
- Generate substantial criteria pollutants from operations that would contribute to existing nonattainment conditions or violate applicable air quality standards;
- Expose sensitive receptors to substantial pollutant concentrations, including concentrations of hazardous air pollutants/toxic air contaminants, during construction and/or operations;
- Create objectionable odors affecting a substantial number of people;
- Result in cumulatively considerable contributions to greenhouse gas emissions in light of state goals for reducing greenhouse gas emissions; or

- Result in cumulatively considerable criteria pollutant emissions during construction and operations.

These criteria are defined further as follows:

Short-term construction criteria air pollutant emissions: The BAAQMD emphasizes implementation of effective and comprehensive control measures rather than requiring a detailed quantification of construction emissions. If effective and comprehensive control measures are implemented as appropriate, then short-term constructions impacts would be reduced to a less-than-significant level. These control measures would be deemed to prevent project construction-related emissions of criteria pollutants from resulting in or substantially contributing to emissions concentrations (e.g., ROG, NO_x, and PM10) that exceed the NAAQS and CAAQS.

According to 40 CFR 93.153, conformity determinations are required for federal actions that occur in nonattainment or maintenance areas and result in generation of emissions that exceed established *de minimis* levels. **Table 4.10-5** summarizes the federal emissions thresholds applicable to this project.

TABLE 4.10-5
FEDERAL GENERAL CONFORMITY
CRITERIA AIR POLLUTANT EMISSION THRESHOLDS

Pollutant	Federal Threshold (tons/year)
NOx	100
ROG	100
CO	100

SOURCE: U.S. Department of Energy, Safety and Health Office of NEPA Policy and Assurance, 2000.

A federal project that does not exceed the *de minimis* threshold rates may still be subject to a general conformity determination if the sum of direct and indirect emissions would exceed 10 percent of the emissions of the nonattainment or maintenance area. If emissions would exceed 10 percent, the federal project is considered “regionally significant,” and thus general conformity rules apply. If the emissions would not exceed the *de minimis* levels and are not regionally significant, then the project is assumed to conform, and no further analysis or determination is required. These standards are applied to construction emissions associated with this project.

Long-term operational criteria air pollutant emissions: Regional impacts would be considered significant if implementation of the proposed project would result in emissions of ROG, NO_x, or PM10 that exceed the BAAQMD thresholds of 15 tons per year. Localized CO impacts would be considered significant if project implementation would result in or substantially contribute to CO concentrations that exceed the California 1-hour ambient air quality standard of 20 ppm or the 8-hour standard of 9 ppm.

Hazardous Air Pollutant (HAP)/Toxic air contaminant (TAC) emissions: HAP/TAC emissions would be considered significant if incremental increases in emissions from the proposed project would be calculated to result in the probability of contracting cancer for the Maximally Exposed Individual (MEI) that exceeds 10 in 1 million, or a Hazard Index (HI) of one.

Odors would be considered significant if proposed project implementation would result in excessive nuisance odors to any considerable number of persons or the public, as defined under the California Code of Regulations, Health & Safety Code section 41700, "Air Quality Public Nuisance."

Greenhouse gas emissions would be considered cumulatively considerable if the proposed project would conflict with the state goal of reducing greenhouse gas emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32, the California Global Warming Solutions Act of 2006. The lead agencies consider a conflict with the state goals identified in AB 32 to arise if a project would not comply with requirements adopted by CARB to carry out AB 32, or if a project would not incorporate features designed to reasonably minimize its GHG emissions, consistent with the policy intent of AB 32. The lead agencies have not established numeric thresholds for determining the significance of GHG emissions. Thus, this determination is qualitative, and is based upon the judgment of the lead agencies in light of the project's quantified direct and indirect emissions of GHGs, the severity of cumulative impacts from climate change, and the GHG minimization features included in the project.

Impact Summary

Table 4.10-6 provides a summary of the impact analysis for issues related to air quality based on actions outlined in Chapter 3.

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no facilities would be constructed. Therefore, this alternative would have no impacts associated with air quality.

Impact 4.10.1: Construction of project alternatives could generate short-term emissions of criteria air pollutants: ROG, NOx, CO, and PM10 that could contribute to existing nonattainment conditions and further degrade air quality. However, project alternatives would not exceed federal general conformity *de minimis* standards for emissions. (Less than Significant with Mitigation)

Introduction

All project alternatives would require land clearing and grubbing, earthmoving for reservoir expansion, cut and fill operations, trenching, soil compaction, and grading. Alternatives 1 through 3 would also require construction of improvements such as roadway surfaces, structures, and facilities. The emissions generated from these construction activities include:

- Dust (including PM10 and PM2.5), primarily from fugitive sources such as soil disturbance and vehicle travel over unpaved surfaces

TABLE 4.10-6
SUMMARY OF IMPACTS – AIR QUALITY

Impact	Project Alternative			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.10.1: Construction of project alternatives could generate short-term emissions of criteria air pollutants: ROG, NOx, CO, and PM10 that could contribute to existing nonattainment conditions and further degrade air quality. However, project alternatives would not exceed federal general conformity *de minimis* standards for emissions.	LSM	LSM	LSM	LSM
4.10.2: Operation of project alternatives would not result in emissions of criteria air pollutants at levels that would substantially contribute to a potential violation of applicable air quality standards or to nonattainment conditions.	LS	LS	LS	LS
4.10.3: Construction and/or operation of project alternatives would not expose sensitive receptors to substantial pollutant concentrations.	LS	LS	LS	LS
4.10.4: Operation of project alternatives would not create objectionable odors affecting a substantial number of people.	LS	LS	LS	LS
4.10.5: Construction and operation of project alternatives would not result in a cumulatively considerable increase in greenhouse gas emissions.	LS	LS	LS	LS
4.10.6: Construction and operation of the project alternatives could result in cumulatively considerable increases of criteria pollutant emissions.	LSM	LSM	LSM	LSM

NOTES:
SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

- Combustion emissions of criteria air pollutants (including ROG, NOx, CO, and PM10), primarily from the operation of heavy construction machinery (primarily diesel operated), portable auxiliary equipment, and construction worker automobile and haul truck trips
- Evaporative emissions (ROG) from asphalt paving (except under Alternative 4)
- Combustion emissions of greenhouse gases, discussed in Cumulative Impact 4.10.5 below.

Construction-related fugitive dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and the weather.

Construction activities would also result in the emission of pollutants from construction equipment exhaust and construction worker automobile and haul truck trips. Emission levels for construction activities would vary depending on the number and type of equipment, duration of use, operating schedules, and the number of construction workers. Criteria pollutant emissions of ROG and NOx from these emission sources would incrementally add to the regional atmospheric loading of ozone precursors during project construction.

Alternative 1

For the worst-case year of construction, it was assumed that construction of all components of Alternative 1 that are anticipated to occur during Year 1 of construction (including reservoir expansion, new Delta Intake and Pump Station, pipeline and electrical facilities) would occur simultaneously. Year 1 was selected because that is the year that the largest amount of construction could occur at the same time. Estimated construction-related fugitive dust emissions, as well as exhaust emissions from construction equipment and worker and haul truck trips are shown in **Table 4.10-7** for the worst-case year.

TABLE 4.10-7
ALTERNATIVE 1 ESTIMATED CONSTRUCTION EMISSIONS (TONS/YEAR) AND FEDERAL GENERAL CONFORMITY THRESHOLDS

		Year 1			
		ROG	**CO**	**NOx**	**PM10**
Reservoir Construction	Off-road Equipment[a]	5	18	37	1
	On-road Vehicles[b]	3	46	31	17
Pipeline, Delta Intake/Pump Station Construction, and Electrical Facility Construction	Off-road Equipment[a]	2	9	16	1
	Pipeline Trucks[c]	0	1	2	0
Fugitive Dust - 15 acres disturbed		0	0	0	20
Total Unmitigated Emissions (tons/year)		10	74	86	39
General Conformity Thresholds – (tons/year)		100	100	100	NA
Significant (Yes or No)?		No	No	No	No

[a] Construction emissions estimates for off-road equipment were made using CARB's OFFROAD2007 model. See Appendix H for more details.
[b] EMFAC2007 emission factors were used to calculate on-road vehicle emissions from truck and worker vehicles. Notably, this value includes worker trips for all other construction components as well as truck trips for all components except for pipeline construction. Refer to Appendix H for more details.
[c] Pipeline trucks were analyzed separately since a portion comes from Southern California and a portion come from Tracy.

NOTES: Values in **bold** are in excess of the applicable General Conformity threshold.

SOURCE: ESA, 2008.

As shown in Table 4.10-7, construction annual emissions would not exceed the Federal General Conformity *de minimis* standards. The general conformity rule also requires that emissions be assessed for regional significance to determine whether the sum of direct and indirect emissions would exceed 10 percent of the emissions of the nonattainment or maintenance area. According to the CARB 2006 Estimated Annual Emissions in the BAAQMD (CARB, 2007e), total emissions of ROG, NOx, and carbon monoxide in the Bay Area Air Basin are approximately 370 tons per day, 525 tons per day, and 1,931 tons per day, respectively. As shown in Table 4.10-7, the annual unmitigated emissions of ROG, NOx, and carbon monoxide generated by Alternative 1 construction would be 10 tons per year (or 0.04 tons per day), 86 tons per year (or 0.3 tons per day), and 74 tons per year (or 0.3 tons per day), respectively. These construction emissions would represent approximately 0.01 percent of the total emissions of ROG in the Bay Area Air Basin, 0.06 percent of the total emissions of NOx in the Bay Area Air Basin, and 0.02 percent of the total emissions of carbon monoxide in the Bay Area Air Basin. Since the emissions associated with construction are less than 10 percent of the total emissions for ROG, NOx, or carbon monoxide, no further analysis for general conformity is required.

In summary, construction emissions for Alternative 1 are not considered significant under the general conformity rule. However, fugitive dust emissions would be considered significant without BAAQMD construction control mitigation measure implementation.

Alternative 2

The potential air quality impacts associated with Alternative 2 would be the same as those described above for Alternative 1 because Alternative 2 includes all the same proposed facilities and construction activities. In summary, construction emissions for Alternative 2 are not considered significant under the general conformity rule. However, fugitive dust emissions would be considered significant without BAAQMD construction control mitigation measure implementation.

Alternative 3

For the worst-case year during construction, it was assumed that construction of all components of Alternative 3 that are anticipated to occur during Year 1 of construction (including reservoir expansion, Old River Intake and Pump Station expansion, construction of pipelines and electrical facilities) would occur simultaneously. Alternative 3 would not include development of the new Delta Intake and Pump Station or the Transfer-Bethany pipeline. As a result, construction activity for this alternative would be less intense than that described for Alternative 1. Estimated construction-related fugitive dust emissions, as well as exhaust emissions from construction equipment and worker and haul truck trips for Alternative 3 are shown in **Table 4.10-8** for the worst-case year.

As shown in Table 4.10-8, construction annual emissions would not exceed the Federal General Conformity *de minimis* standards.

The general conformity rule also requires that emissions be assessed for regional significance to determine whether the sum of direct and indirect emissions would exceed 10 percent of the emissions of the nonattainment or maintenance area. According to the CARB 2006 Estimated Annual Emissions in the BAAQMD (CARB, 2007e), total emissions of ROG, NOx, and carbon monoxide in the Bay Area Air Basin are approximately 370 tons per day, 525 tons per day, and 1,931 tons per day, respectively. As shown in Table 4.10-8, the annual unmitigated emissions of ROG, NOx, and carbon monoxide generated by Alternative 3 construction would be 10 tons per year (or 0.04 tons per day), 84 tons per year (or 0.3 tons per day), and 73 tons per year (or 0.3 tons per day), respectively. These construction emissions would represent approximately 0.01 percent of the total emissions of ROG in the Bay Area Air Basin, 0.06 percent of the total emissions of NOx in the Bay Area Air Basin, and 0.02 percent of the total emissions of carbon monoxide in the Bay Area Air Basin. Since the emissions associated with alternative construction are less than 10 percent of the total emissions for ROG, NOx, or carbon monoxide, no further analysis for general conformity is required.

TABLE 4.10-8
ALTERNATIVE 3 ESTIMATED CONSTRUCTION EMISSIONS (TONS/YEAR) AND FEDERAL GENERAL CONFORMITY THRESHOLDS

		Year 1			
		ROG	CO	NOx	PM10
Reservoir Construction	Off-road Equipment[a]	5	18	37	1
	On-road Vehicles[b]	3	46	31	17
Pipeline, Old River Intake/Pump Station Expansion, and Electrical Facility Construction	Off-road Equipment[a]	2	8	14	1
	Pipeline Trucks[c]	0	1	2	0
Fugitive Dust - 15 acres disturbed		0	0	0	20
Total Unmitigated Emissions (tons/year)		10	73	84	39
General Conformity Thresholds – (tons/year)		100	100	100	NA
Significant (Yes or No)?		No	No	No	No

[a] Construction emissions estimates for off-road equipment were made using CARB's OFFROAD2007 model. See Appendix H for more details.
[b] EMFAC2007 emission factors were used to calculate on-road vehicle emissions from truck and worker vehicles. Notably, this value includes worker trips for all other construction components as well as truck trips for all components except for pipeline construction. Refer to Appendix H for more details.
[c] Pipeline trucks were analyzed separately since a portion come from Southern California and a portion come from Tracy.

NOTES: Values in **bold** are in excess of the applicable General Conformity threshold.

SOURCE: ESA, 2008.

In summary, construction emissions for Alternative 3 are not considered significant under the general conformity rule. However, fugitive dust emissions would be considered significant without BAAQMD construction control mitigation measure implementation.

Alternative 4

Alternative 4 is the smallest reservoir expansion considered, and has fewer new or expanded facilities than Alternatives 1, 2, and 3. Under Alternative 4, additional intake capacity is not required. The existing pipeline from the Old River Pump Station to the Transfer Facility and up to the reservoir would be used as is, with no capacity expansion required. The pumps at the existing Transfer Facility would be upgraded but all work would be done within the existing structure. No new conveyance pipeline connecting to the SBA system would be constructed. No new power facilities would be required under this alternative.

For the worst-case year of construction, it was assumed that the reservoir expansion construction activities would be the same as those under Alternative 1, 2, and 3. As explained above, no construction of intake, conveyance or electrical facilities would occur. Estimated construction-related fugitive dust emissions, as well as exhaust emissions from construction equipment and worker and haul truck trips for Alternative 4 are shown in **Table 4.10-9** for the worst-case year.

As shown in Table 4.10-9, construction annual emissions would not exceed the Federal General Conformity *de minimis* standards.

TABLE 4.10-9
ALTERNATIVE 4 ESTIMATED CONSTRUCTION EMISSIONS (TONS/YEAR) AND FEDERAL GENERAL CONFORMITY THRESHOLDS

		Year 1			
		ROG	**CO**	**NOx**	**PM10**
Reservoir Construction	Off-road Equipment[a]	5	18	37	1
	On-road Vehicles[b]	3	46	31	17
Fugitive Dust - 10 acres disturbed		0	0	0	13
Total Unmitigated Emissions (tons/year)		8	64	68	31
General Conformity Thresholds – (tons/year)		100	100	100	NA
Significant (Yes or No)?		No	No	No	No

[a] Construction emissions estimates for off-road equipment were made using CARB's OFFROAD2007 model. See Appendix H for more details.
[b] EMFAC2007 emission factors were used to calculate on-road vehicle emissions from truck and worker vehicles. Refer to Appendix H for more details.

NOTES: Values in **bold** are in excess of the applicable General Conformity threshold.

SOURCE: ESA, 2008.

The general conformity rule also requires that emissions be assessed for regional significance to determine whether the sum of direct and indirect emissions would exceed 10 percent of the emissions of the nonattainment or maintenance area. According to the CARB 2006 Estimated Annual Emissions in the BAAQMD (CARB, 2007e), total emissions of ROG, NOx, and carbon monoxide in the Bay Area Air Basin are approximately 370 tons per day, 525 tons per day, and 1,931 tons per day, respectively. As shown in Table 4.10-9, the annual unmitigated emissions of ROG, NOx, and carbon monoxide generated by Alternative 4 construction would be 8 tons per year (or 0.03 tons per day), 68 tons per year (or 0.3 tons per day), and 64 tons per year (or 0.3 tons per day), respectively. These construction emissions would represent approximately 0.008 percent of the total emissions of ROG in the Bay Area Air Basin, 0.06 percent of the total emissions of NOx in the Bay Area Air Basin, and 0.02 percent of the total emissions of carbon monoxide in the Bay Area Air Basin. Since the emissions associated with alternative construction are less than 10 percent of the total emissions for ROG, NOx, or carbon monoxide, no further analysis for general conformity is required.

In summary, construction emissions for Alternative 4 are not considered significant under the general conformity rule. However, fugitive dust emissions would be considered significant without BAAQMD construction control mitigation measure implementation.

Mitigation Measures

Measure 4.10.1: During construction, CCWD will require the construction contractor to implement the measures that are specified under BAAQMD's basic and enhanced dust control procedures. These include:

- Basic Control Measures – CCWD and its contractors will implement the following controls at all construction sites:
  - Water all active construction areas at least twice daily.
  - Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard.
  - Pave, apply water three times daily, or apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
  - Sweep daily (with water sweepers) all paved access roads, parking areas, and staging area at construction sites.
  - Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Enhanced Control Measures – CCWD and its contractors will implement the following measures during project construction for project facility sites of 4 acres or greater:
  - Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas inactive for one month or more).
  - Enclose, cover, water twice daily, or apply (nontoxic) soil stabilizers to exposed stockpiles (such as dirt and sand).
  - Limit traffic speeds on unpaved roads to 15 miles per hour.
  - Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
  - Replant vegetation in disturbed areas as quickly as possible.
- CCWD and its contractors will implement the following additional control measure during reservoir expansion construction due to the large area of disturbance:
  - Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site onto public roads.

Impact Significance after Mitigation: Less than Significant.

Impact 4.10.2: Operation of the project alternatives would not result in emissions of criteria air pollutants at levels that would substantially contribute to a potential violation of applicable air quality standards or to nonattainment conditions. (Less than Significant)

All Alternatives

None of the alternatives would include facility operations that would directly emit criteria air pollutants. However, two other sources of emissions are associated with operation of project facilities. Use of motor vehicles to travel to and from project facilities would generate mobile sources of criteria pollutant emissions, and generation of electricity to serve the project would result in emissions outside of the project area. These are described below.

Mobile Sources. Operation of project facilities under each of the alternatives is anticipated to generate traffic volumes similar to the existing traffic volumes since operation of the expanded system would require fewer than 10 new employees. There would be a very small increase in maintenance worker trips to and from expanded or new facilities, but this increase would be less than a combined total of one round trip per week. Visitor and employee trips associated with use of the recreation facilities at the expanded reservoir are also expected to be similar to current conditions. Therefore, the addition of traffic from project operations would result in a negligible increase in regional emissions of criteria air pollutants.

Electricity. Each of the alternatives would result in additional electricity consumption (approximately 54,300 megawatt-hours per year for Alternative 1, 61,200 megawatt-hours per year for Alternative 2, 22,900 megawatt-hours per year for Alternative 3, and 2,400 megawatt-hours per year for Alternative 4) associated with pumping operations. However, because (1) emissions from electrical generating facilities would generally be located outside the Bay Area Air Basin; (2) the facilities would be equipped with Best Available Control Technology (BACT) and would be permitted as stationary sources; and (3) the emissions would be offset by the use of pollution credits, the emission of criteria pollutants from off-site generation of electricity is excluded from the evaluation of project significance for criteria pollutants (CCWD and Reclamation, 2006). These emissions are, however, considered below under the evaluation of increases in emissions of GHGs.

In summary, the project alternatives would not result in operational emissions that would exceed BAAQMD's thresholds of significance. Consequently, the project-generated emissions would not be anticipated to result in a substantial contribution to a potential violation of NAAQS, CAAQS, or the nonattainment conditions. As a result, this impact would be less than significant.

Mitigation: None required.

Impact 4.10.3: Construction and/or operation of the project alternatives would not expose sensitive receptors to substantial pollutant concentrations. (Less than Significant)

All Alternatives

Carbon Monoxide (CO) Hotspots

CO is a localized pollutant of concern. The majority of construction activities would occur in the watershed, at a substantial distance from any sensitive receptors. Although portions of pipeline construction could occur approximately 50 feet from sensitive residences, CO background concentrations (where air districts still monitor CO) and the average emissions from vehicles and equipment continue to decline. Construction activities for the proposed project would not emit CO in quantities that could pose health concerns.

Project operations also would not be anticipated to result in or contribute to CO concentrations that exceed the California 1-hour ambient air quality standard of 20 ppm or the 8-hour standard of 9 ppm because of the negligible amount of project-generated trips for operation and maintenance, as discussed above in Impact 4.10.2. The BAAQMD generally does not recommend a detailed air quality analysis for projects generating less than 2,000 trips per day (BAAQMD, 1999). Thus, increases in mobile-source emissions of CO associated with project operations would not be anticipated to result in or contribute substantially to an air quality violation. The project and the alternatives would not result in significant localized concentrations of criteria pollutants.

Toxic Air Contaminants

Construction of the proposed project would result in short-term diesel exhaust emissions (DPM), which are TACs, from on-site heavy-duty equipment. Project construction would generate DPM emissions from the use of off-road diesel equipment required for site grading and excavation, paving, and other construction activities. The dose to which sensitive receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for the maximally exposed individual. Thus, the risks estimated for a maximally exposed individual are higher if a fixed exposure occurs over a longer period of time. According to the Office of Environmental Health Hazard Assessment (OEHHA), health risk assessments, which determine the exposure of sensitive receptors to toxic emissions, should be based on a 70-year exposure period; however, such assessments should be limited to the period/duration of activities associated with the project. Thus, the duration of the proposed construction activities (3 years) would only constitute approximately 4 percent of the total exposure period for Alternatives 1, 2, and 3, or 3 percent of the total exposure period for Alternative 4 (2 years). In addition, the majority of project construction activity would occur in the watershed at a substantial distance from sensitive receptors. Portions of pipeline and electrical transmission line construction could occur approximately 50 feet from residences; however, these construction activities would move along the alignment on a daily basis and would not result in extended exposure of residences to DPM. While the length of construction time in front of any given property would vary, it would not be expected to be greater than two weeks at a single point along the alignment. Because the use of mobilized equipment would be temporary and there are no sensitive receptors located immediately adjacent to areas where construction would occur for prolonged periods, DPM from construction activities would not be anticipated to result in the exposure of sensitive receptors to levels that exceed applicable standards.

In addition, the long-term operation of the project would not result in any non-permitted sources of toxic air emissions. As a result, exposure of sensitive receptors to substantial toxic air emissions from the project alternatives would be less than significant.

Mitigation: None required.

Impact 4.10.4: Operation of the project alternatives would not create objectionable odors affecting a substantial number of people. (Less than Significant)

All Alternatives

Types of land uses that typically pose potential odor problems include agriculture, wastewater treatment plants, food processing and rendering facilities, chemical plants, composting facilities, landfills, waste transfer stations, and dairies. In addition, the occurrence and severity of odor impacts depend on numerous factors, including the nature, frequency, and intensity of the source; wind speed and direction; and the presence of sensitive receptors. Although offensive odors rarely cause any physical harm, they can still be very unpleasant, leading to considerable distress and often generating citizen complaints to local governments and regulatory agencies.

The project alternatives do not include any of these land use activities or similar land uses. Therefore, none of the proposed project alternatives would create objectionable odors that would affect a substantial number of people during operations. Occasionally, diesel equipment exhaust can generate objectionable odors, but these dissipate very quickly. Thus, neither construction nor the operation of the project alternatives would result in the creation of, or frequent exposure to, an objectionable odor and odor impacts would be less than significant.

Mitigation: None required.

Cumulative Impact 4.10.5: Construction and operation of the project alternatives would not result in a cumulatively considerable increase in greenhouse gas emissions. (Less than Significant)

All Alternatives

The California Energy Commission (CEC) estimated that in 2004 California produced 500 million gross metric tons (about 550 million U.S. tons) of carbon dioxide-equivalent GHG emissions.[6] The CEC found that transportation is the source of 38 percent of the State's GHG emissions, followed by electricity generation (both in-state and out-of-state) at 23 percent and industrial sources at 13 percent (CEC, 2006).

In the Bay Area, fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) is the single largest source of the Bay Area's GHG emissions, accounting for just over half of the Bay Area's 85 million tons of GHG emissions in 2002. Industrial and commercial sources were the second largest contributors of GHG emissions with about one-fourth of total emissions. Domestic sources (e.g., home water heaters, furnaces, etc.) account for about 11 percent of the Bay Area's GHG emissions, followed by power plants at 7 percent. Oil refining currently accounts for approximately 6 percent of the total Bay Area GHG emissions (BAAQMD, 2006b).

6 Because of the differential heat absorption potential of various GHGs, GHG emissions are frequently measured in "carbon dioxide-equivalents," which present a weighted average based on each gas's heat absorption (or "global warming") potential.

Project GHG emissions

"The most common GHG that results from human activity is carbon dioxide, followed by methane and nitrous oxide" (OPR, 2008). State law defines GHG to also include hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. These latter GHG compounds are usually emitted in industrial processes, and therefore not applicable to the proposed project. The calculation presented below includes construction emissions in terms of CO_2[7], and annual CO_2E GHG emissions from increased energy consumption. **Appendix H** contains information used in this analysis regarding construction scenario and energy use scenario assumptions as well as the emissions calculations used in this analysis.

Construction Emissions

Project construction would result in temporary increases in GHG emissions associated with transportation of construction materials, most notably pipeline segments and dam construction materials, as well as construction equipment operation and worker transportation. Most of the materials required for construction of the dam raise modification for reservoir expansion would be obtained from on-site borrow areas within the watershed, minimizing the need for materials transport. In addition, much of the material excavated from the proposed pipeline trenches would be reused as backfill, minimizing the need to haul material offsite for reuse or disposal elsewhere. Although the project has been designed to minimize material hauling requirements, some materials would need to be imported to the project area for the dam modification and construction of the pipelines and other facilities (e.g., engineered fill and concrete). In addition, pipeline construction would require import of pipeline segments to the project area from a pipe manufacturer. Because not all pipe manufactures make large diameter pipe of the size that might be used for the project (e.g., 132 inches in diameter), for purposes of calculating materials transportation and associated GHG emission, it was assumed that pipeline segments less than 132 inches in diameter would be manufactured in Tracy, California and that pipeline segments of 132 inches in diameter would be manufactured and transported in southern California. Appendix H provides additional details about the construction scenario assumptions used in this analysis and presents the emissions calculations.

Based on the assumptions regarding materials hauling and construction equipment operation during a worst case year of construction when activity at all project sites would occur simultaneously, construction of the project alternatives would emit approximately 22,550 metric tons CO_2E for Alternatives 1 or 2, approximately 22,285 metric tons CO_2E for Alternative 3, and approximately 19,600 metric tons CO_2E for Alternative 4.

Operational Emissions

Energy Use. Operation of the expanded Los Vaqueros Reservoir system would result in indirect GHG emissions due to increased energy use. **Table 4.10-10** summarizes the GHG emissions resulting from operation of the project under each of the four project alternatives and for Future Without Project conditions. The estimated metric tons of CO_2E for each alternative includes increases

7 Construction emissions of carbon dioxide (CO_2) were calculated based on OFFROAD2007 and EMFAC2007 emission factors. N_2O and CH_4 were not quantified for construction activities since they contribute insignificant amounts to the total GHGs during construction.

TABLE 4.10-10
INDIRECT GHG EMISSIONS FROM PROJECT ELECTRICITY USE
(METRIC TONS/YEAR)[1]

Operational Emissions	Total Metric Tons/Year CO_2E	Increase in Metric Tons/Year CO_2E[3]
Future Without Project[2]	26,000	n/a
Alternative 1	33,800	7,900
Alternative 2	34,900	9,000
Alternative 3	30,400	4,400
Alternative 4	26,400	500

1 Metric tons/year of CO_2E were calculated using the *California Climate Action Registry General Reporting Protocol* emission factors and methodology. See Appendix H for more details.
2 "Future Without Project" includes power required for pumping at Banks and Jones Pumping Plants needed to deliver water to the SBA, SCVWD via San Luis Reservoir, and power required at CCWD's pumping facilities.
3 "Increase in Metric Tons/Year" shows the increase in the total emissions for each alternative compared to the emissions for "Future Without Project"

SOURCE: ESA, 2008; California Climate Action Registry, 2008; CCWD, 2008

in energy use associated with increased water diversion and pumping through the expanded Los Vaqueros Reservoir system and decreased energy use for the state and/or federal Delta water systems associated with a commensurate reduction in water pumping (See Appendix H for more detailed information about water system pumping). As described in Chapter 4.12 (Utilities and Public Service Systems) of this document, hydroelectric energy is a chief source of the energy delivered to the existing Los Vaqueros Reservoir system now and would be in the future as well. Compared to both existing conditions and future conditions without the project, GHG emissions would increase for all alternatives as a result of increased energy use to support increased pumping through the expanded system. These increases in emissions from electricity use would be minimized by implementing the project design features discussed below.

Reservoir Expansion. There is also the potential for additional GHG emissions (CO_2 and CH_4) from the expanded reservoir. There is apparent agreement within the scientific community that reservoirs can produce carbon dioxide and methane gases as a result of inundation and decomposition of vegetation, but disagreement on exactly how much of these gases are sequestered in reservoirs versus released into the atmosphere. At present there are no established methodologies or emission factors to quantify emission reductions or increases from reservoirs in different regions (Fearnside, 2004; NAST, 2006). However, estimates have been made for the project alternatives.

Methane production in reservoirs results from decomposition of organic matter in anoxic conditions and has been identified in some reservoirs, principally in tropical regions. For the Los Vaqueros Reservoir, submerged biomass will be minimized prior to initial filling to minimize methane emissions caused by inundation. In addition, the Los Vaqueros Reservoir is managed to maintain oxygen levels and avoid anoxic conditions at all levels of the Reservoir as an important part of maintaining water quality. The expanded reservoir will also be managed to avoid anoxic conditions. Generally wind conditions in the Los Vaqueros Reservoir minimize stratification and enhance mixing in a way that oxygen is not depleted in the reservoir. When oxygen levels deep in the reservoir fall, an oxygenation system is employed to maintain oxygen levels; this operation would be continued in the expanded reservoir. Consequently, no significant increase in methane production is anticipated under any of the project alternatives.

Carbon dioxide production from decay of organic matter in newly inundated areas can be estimated from the vegetation load in those areas. Typically, the Los Vaqueros watershed is managed to have a vegetation load of about 700 pounds per acre when grazed, and less than 2000 pounds per acre when not grazed. Assuming the inundated area is 2000 pounds per acre, and there is no sequestering of this material in the reservoir whatsoever, the maximum amount of carbon dioxide production from decomposition of the inundated area is about 1,600 tons total for Alternatives 1, 2 and 3; this would be released over several years. If 50% of the carbon is sequestered into reservoir sediments, the total amount released would be about 800 tons. Grazing to reduce the vegetation prior to inundation would reduce the 1,600 metric tons to about 600 metric tons total and less if any carbon is sequestered in reservoir sediments. The level for Alternative 4 would be less than half these levels.

Another source of carbon to the reservoir is that which arrives with the water pumped into the reservoir. Typically, source water contains an average of 4.2 mg/l total organic carbon (TOC) during the filling season. Water leaving the reservoir has typical TOC levels of about 3.2 mg/l. Some of the TOC is likely to be sequestered in reservoir sediments, either directly through sedimentation of particulate organic carbon, or indirectly through initial uptake by organisms. If all the net carbon addition to the reservoir is converted to carbon dioxide (i.e., 4.2 mg/l input less 3.2 mg/l released), then the net increase in carbon dioxide production would be at most 135 metric tons per year of CO_2E for Alternatives 1, 2 or 3; Alternative 4 would be less than 15 tons per year. If any of the net carbon addition is sequestered, these levels would be reduced by the amount sequestered.

Algae and vegetation that grows in the reservoir would increase due to increased surface area and shallow water areas. This will take up carbon dioxide from the atmosphere. Some of that carbon would be sequestered in reservoir sediments and some would decay and go back to carbon dioxide, for a likely net sequestering of a small amount of carbon per year.

Overall, the potential net production of greenhouse gases within the reservoir as a result of reservoir expansion is not significant compared to that estimated from net energy use; it is possible that the reservoir could sequester a small amount of carbon; such an amount would also likely be not significant compared to net energy use.

Project Contribution to Cumulative Climate Change Effects from Greenhouse Gas Emissions

The project's incremental increases in GHG emissions associated with construction and electricity use and reservoir expansion would contribute to regional and global increases in GHG emissions and associated climate change effects. Until a statewide threshold has been adopted, for this analysis the following three questions are considered to assess whether the project would be in conflict with the state goals for reducing GHG emissions and make a cumulatively considerable contribution to GHG emissions.

A) Does the proposed project conflict with any measures adopted by CARB for implementation of AB 32?

B) What is the level of emissions for the proposed project in relation to the estimated GHG emissions for the Bay Area, as well as to the major facilities that are required to report GHG emissions (25,000 metric tons/year CO_2E)?

C) Are the basic parameters of the proposed project inherently energy efficient?

With regard to whether the project alternative would conflict with measures adopted by CARB, Table 4.10-3 in the setting section summarizes the most recent list of the CARB early action strategies. Few of these measures are relevant to the project. The five strategies that are relevant to the project alternatives relate primarily to fuel efficient, low emission vehicles and emission reduction methods for vehicles. These measures include (1) above ground storage tanks for fuels; (2) non-agricultural diesel off-road equipment; (3) privately owned on-road diesel trucks; (4) anti-idling enforcement of heavy trucks; and (5) tire inflation program.

CCWD is already in the process of converting its vehicle fleet to fuel efficient, low emission vehicles and the District's current vehicle maintenance procedures implement the recommended tire inflation strategy to maintain fuel efficiency. CCWD personnel working on the project (e.g., engineers, inspectors) would use the District's low emission, fuel efficient fleet vehicles. CCWD would also include anti-idling requirements in contractor specifications to reduce emissions from construction equipment and haul trucks. For these reasons, the project alternatives would not conflict with any of the CARB early action strategies.

With implementation of the project alternatives GHG emissions during construction for a worse-case year would range from approximately 19,600 metric tons CO_2E (Alternative 4) to 22,550 metric tons CO_2E (Alternatives 1 and 2). These construction emissions represent approximately 0.02 to 0.03 percent, of Bay Area GHGs emitted in 2002, respectively.[8] As shown in Table 4.10-8, the increase in indirect GHG emissions from project electricity use for each alternative would be no more than 9,000 metric tons/year CO_2E. This is well under the 25,000 metric tons/year CO_2E threshold used to classify major emitters. In comparison to Bay Area GHG emissions, the project alternatives' future increases in annual operational emissions represent approximately 0.009 percent (Alternative 1), 0.01 percent (Alternative 2), 0.005 percent (Alternative 3), and 0.0006 percent (Alternative 4) of total Bay Area GHGs emitted in 2002. The 2020 GHG emissions limit for California, as adopted by CARB in December of 2007 is approximately 427 million metric tons of CO_2E. The proposed project's annual contribution would be approximately 0.002 percent (Alternative 1), 0.002 percent (Alternative 2), 0.001 percent (Alternative 3), and 0.0001 percent (Alternative 4) of this total 2020 emissions limit.

With respect to the question of energy efficiency, the project alternatives are designed to be energy efficient. The project alternatives include the following features that reduce energy use and consequently minimize GHG emissions.

8 The Bay Area Air Quality Management District reported regional Bay Area GHGs emissions in 2002 at approximately 85 million CO_2E tons. Bay Area 2002 GHG emissions are used as the baseline for determining whether a project's contributions are significant as these are the most recent emissions inventory for the bay area.

- *On-site borrow areas for dam construction materials*. Designated borrow areas have been identified with the Los Vaqueros Watershed for each alternative to supply most of the materials needed for construction of the expanded dam core and shell. This minimizes vehicle miles traveled, and associated emissions, from transportation of materials to the project site.

- *Local acquisition opportunities for construction materials to be imported*. While some construction materials will need to be imported to the project sites, most will be acquired locally from mining operations and manufacturers in northern California, including concrete supply and many of the pipeline segments. Local acquisition limits the potential materials hauling distances required for the project, which also reduces vehicle miles traveled and associated emissions.

- *Efficient (high efficiency) pumping facilities*. All new pumping facilities or pump station upgrades will make use of current, high energy efficiency equipment to minimize energy use and operational cost.

- *Renewable energy generation and energy recovery*. Renewable energy generation and energy recovery will be incorporated into the project design. Solar panels will be incorporated into the roofing of the Marina Complex and new interpretive center. Energy recovery will be implemented through hydroelectric generation incorporated into the proposed Transfer- Bethany pipeline.

- *Fuel efficient / low emission vehicles*. CCWD is already in the process of converting its vehicle fleet to increase the number of fuel-efficient, low emission vehicles. CCWD personnel will use these vehicles during project construction and operations.

CCWD continues to implement measures that reduce its GHG emissions system wide throughout its raw and treated water systems. The District is currently implementing an energy recovery project at its flow control structure #2 located at the Neroly Blending Basin, where the LV Pipeline empties into the Contra Costa Canal. In addition, CCWD has started a pilot program to convert existing treated water pump stations throughout its system to solar power. CCWD also supports wind power generation on its watershed lands, consistent with its water quality and resource management objectives for the watershed. The District has reserved additional wind rights within the watershed and leases its lands for wind power generation.

The District also continues to promote water conservation and efficiency as a way to save both water and energy, thereby reducing GHG emissions. CCWD currently saves approximately 3.3 TAF annually through its conservation program, and estimates savings of about 10 TAF annually by 2050 (CCWD, 2007). Current recycled water use within CCWD is approximately 8.6 TAF annually, and is expected to grow to approximately 13 TAF annually by 2010 (CCWD, 2005). Taken together, conservation and recycling have reduced CCWD's water deliveries from the Delta, reducing associated water pumping and related GHG emissions.

Summary

Based upon the analysis presented above, the project alternatives would not result in a cumulatively considerable increase in GHG emissions such that the project would impair the State's ability to implement AB 32.

Mitigation: None required.

Cumulative Impact 4.10.6: Construction and operation of the project alternatives could result in cumulatively considerable increases of criteria pollutant emissions. (Less than Significant with Mitigation)

All Alternatives

In regards to cumulative construction impacts, the Los Vaqueros Reservoir Expansion project requires BAAQMD dust control measures, which are intended to reduce individual project emissions. Other projects to be constructed would also be required to include similar BAAQMD control measures to reduce emissions. Thus, with mitigation, the Los Vaqueros Reservoir Expansion project would not make a cumulatively considerable contribution to short-term construction emissions.

For long-term operational effects, the BAAQMD recommends a tiered approach to significance determination where a project does not individually have a significant operational air quality impacts, as here. No cumulative impact will be found where:

1. The local general plan is consistent with the latest Clean Air Plan (CAP), which is currently the Bay Area 2005 Ozone Strategy (BAAQMD, 2006a); and

2. The project is consistent with the local general plan.

The Los Vaqueros Reservoir Expansion project does not individually have significant operational air quality impacts. In regards to condition (1), BAAQMD CEQA Guidelines specify that CAP consistency be based on: (a) population projections consistent with CAP and ABAG projections, (b) rate of increase of VMT does not exceed rate of increase in population, (c) CAP transportation control measures (TCMs) are being implemented by the applicable local governments, and (d) buffer zones are provided around sources of odors, toxics, and accidental releases. For criteria (a), as described in Chapter 4.20, the proposed project would improve water supply reliability for some water users in Alameda County, Contra Costa County, and Santa Clara County. The project is not considered to be growth inducing and therefore would not result in increased populations in these areas that would be inconsistent with adopted local land use plans or inconsistent with the BAAQMD CAP. For criteria (b), the project would result in a negligible long-term increase in VMT since there would be less than 10 new employees. The project would not result in an increase in population growth or a noticeable increase in VMT, so the rate of increase of VMT would not exceed the rate of growth of population. For criteria (c), **Table 4.10-11** identifies those TCMs that local governments should implement through local plans. The project is in the jurisdiction of Contra Costa County and Alameda County. The Contra Costa County General Plan (Contra Costa County, 2005) and the Alameda County East Area Plan (Alameda County, 2002) each incorporate policies to implement the TCMs in the Transportation Element of the respective General Plan. For criteria (d), as described in Impact 4.10.3 and Impact 4.10.4, the project would not be a source of substantial TAC emissions or odors.

TABLE 4.10-11
TCMS IN THE BAY AREA OZONE STRATEGY TO BE IMPLEMENTED BY LOCAL GOVERNMENTS

1. Support Voluntary Employer-Based Trip Reduction Programs
2. Improve Bicycle Access and Facilities
3. Improve Arterial Traffic Management
4. Local Clean Air Plans, Policies and Programs
5. Conduct Demonstration Projects
6. Pedestrian Travel
7. Promote Traffic Calming Measures

SOURCE: BAAQMD, 2006a.

For condition (2), the proposed project would not require a general plan amendment, and would therefore be consistent with the applicable general plans. Furthermore, as discussed above under Impact 4.10.2, the project would result in minimal criteria pollutant emissions during long-term operations since pumps would be electrically powered and there would be negligible VMT from the less than 10 new employees.

Based on criteria (1) and (2) described above, the proposed project would result in a less than significant cumulative impact.

Implement Mitigation Measure 4.10.1.

Impact Significance after Mitigation: Less than Significant.

4.11 Noise

This section provides an overview of the existing noise environment in the Los Vaqueros Reservoir Expansion Project area, as well as the regulatory framework, an analysis of potential noise impacts that would result from implementation of the project and alternatives, and mitigation measures where appropriate.

4.11.1 Affected Environment

Noise and Vibration Principles

Noise Descriptors

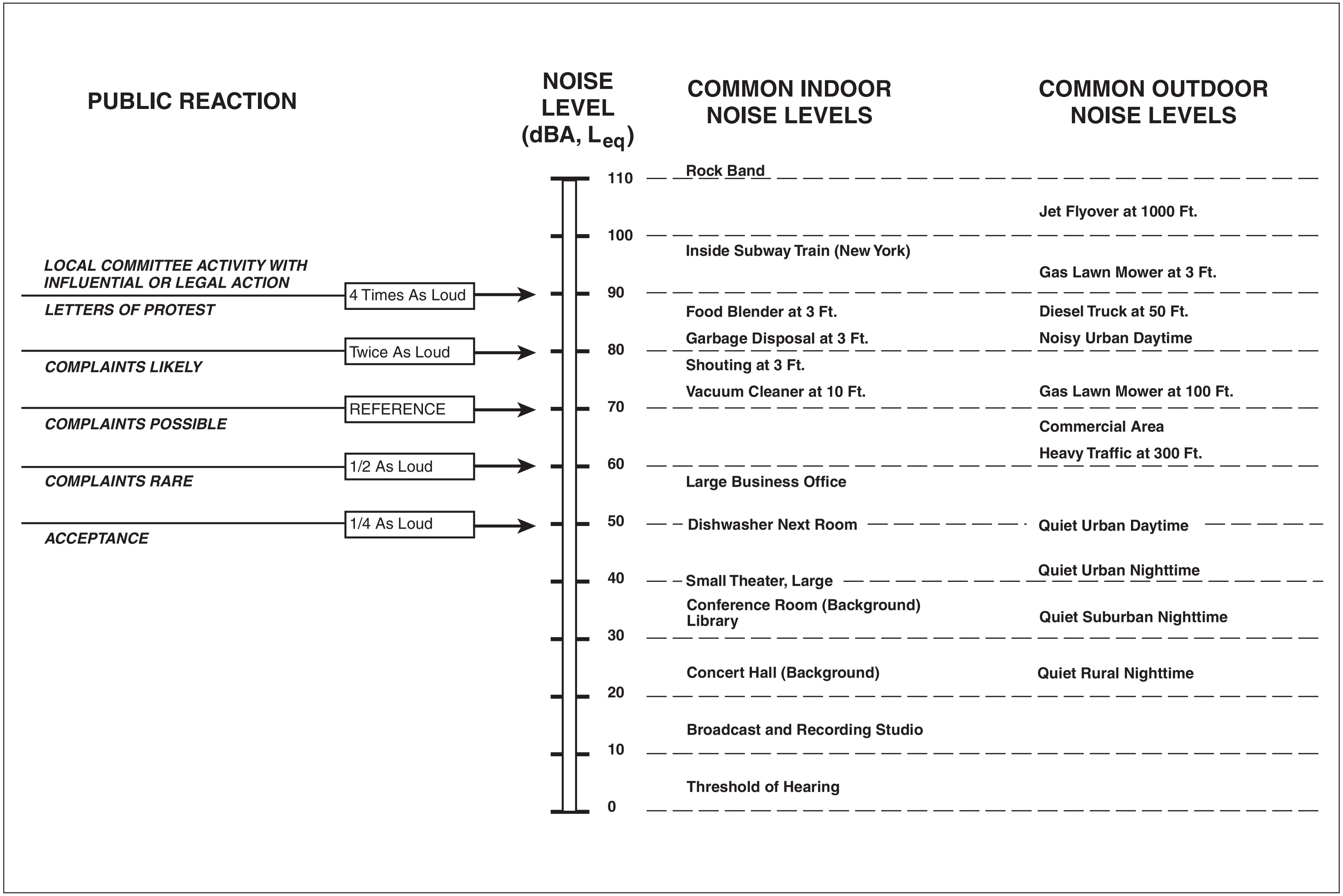
Noise is defined as unwanted sound. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) which is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. Pressure waves traveling through air exert a force registered by the human ear as sound.

Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). When all the audible frequencies of a sound are measured, a sound spectrum is plotted consisting of a range of frequency spanning 20 to 20,000 Hz. The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the sound frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ears decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements. Some representative noise sources and their corresponding A-weighted noise levels are shown in **Figure 4.11-1**.

Noise Exposure and Community Noise

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise at a given instant in time. The noise levels presented in Figure 4.11-1 are representative of measured noise at a given instant in time; however, they rarely persist consistently over a long period of time. Rather, community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day but does so gradually, corresponding with the addition and subtraction



SOURCE: ESA, 2008

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Figure 4.11-1
Effects of Noise on People

of distant noise sources such as traffic and atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual.

These successive additions of sound to the community noise environment varies the community noise level from instant to instant, thus requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

Leq: The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

Lmax: The instantaneous maximum noise level for a specified period of time.

L50: The noise level that is equaled or exceeded 50 percent of the specified time period. The L50 represents the median sound level.

L90: The noise level that is equaled or exceeded 90 percent of the specified time period. The L90 is sometimes used to represent the background sound level.

DNL: The 24-hour day and night A-weighted noise exposure level, which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.

CNEL: Similar to the DNL, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between 10:00 p.m. and 7:00 a.m.

As a general rule, in areas where the noise environment is dominated by traffic, the Leq during the peak hour is generally equivalent to the DNL at that location (Caltrans, 1998).

Effects of Noise on People

The effects of noise on people can be placed into three categories:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, or learning
- Physiological effects such as hearing loss or sudden startling

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the last category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise. Thus, an important way of predicting a human reaction to a new noise environment is the way the noise compares to the existing environment to which one has adapted: the so called "ambient noise" level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected.
- A 10-dBA change is subjectively heard as approximately a doubling in loudness, and can cause an adverse response.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a nonlinear fashion; hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion but increase logarithmically. For example, if two identical noise sources produce noise levels of 50 dBA, the combined sound level would be 53 dBA, not 100 dBA.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate between 6 dBA for hard sites and 7.5 dBA for soft sites for each doubling of distance from the reference measurement. Hard sites are those with a reflective surface between the source and the receiver, such as parking lots or smooth bodies of water. No excess ground attenuation is assumed for hard sites, and the changes in noise levels with distance (the drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface such as soft dirt, grass, or scattered bushes and trees. In addition to geometric spreading, an excess ground attenuation value of 1.5 dBA (per doubling distance) is normally assumed for soft sites. Line sources (such at traffic noise from vehicles) attenuate at a rate between 3 dBA for hard sites and 4.5 dBA for soft sites for each doubling of distance from the reference measurement (Caltrans, 1998).

Fundamentals of Vibration

As described in the Federal Transit Administration's *Transit Noise and Vibration Impact Assessment* (FTA, 2006), ground-borne vibration can be a serious concern for nearby neighbors of a transit system route or maintenance facility; ground-borne vibration can cause buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, ground-borne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even close to major roads. Some common sources of ground-borne vibration are trains, buses on rough roads, and construction activities such as blasting, pile-driving, and operating heavy earthmoving equipment.

Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the affect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (Vdb) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration. Typically, ground-borne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors for vibration include structures (especially older masonry structures), people (especially residents, the elderly, and sick), and vibration-sensitive equipment.

Ground-borne vibration can cause movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Buildings are rarely damaged during construction projects, although blasting and pile-driving have on occasion caused building damage. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance will be well below the damage threshold for normal buildings. The Federal Transit Administration (FTA) measure of the threshold of architectural damage for conventional sensitive structures is 0.2 inch per second PPV, and the FTA threshold of human annoyance to ground-borne vibration is 80 RMS (FTA, 2006).

In regards to blasting activities, the term "blast noise" is misleading because the largest component of blast-induced noise occurs at frequencies below the threshold-of-hearing for humans (16 to 20 Hz). Hence, the common industry term for blast-induced noise is "air-overpressure". As its name implies, air-overpressure is a measure of the transient pressure changes. These low-intensity pulsating pressure changes, above and below ambient atmospheric pressure, are manifested in the form of acoustical waves traveling through the air. When measurements include the low frequency component they are called linear scale measurements and are expressed as dBL. Air-overpressure has a 133 dBL regulatory limit used by the US Bureau of Mines for air-overpressure measured with a 2-Hz response seismograph. Research into window damage caused by overpressure has shown first failures occur at 150dBL with substantial window damage occurring at 160dBL.

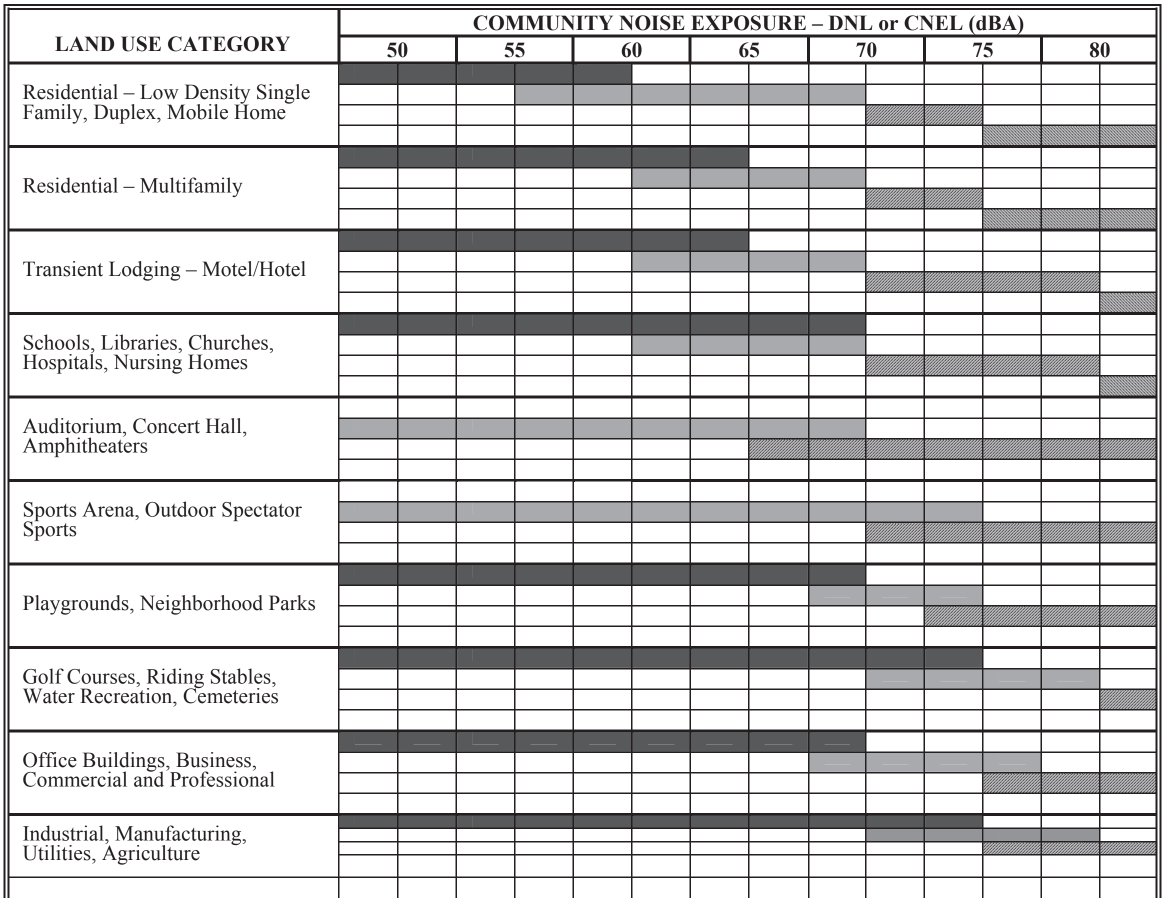
Regulatory Setting

Federal

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under the Code of Federal Regulations, Title 40, Part 205, Subpart B. The federal truck pass-by noise standard is 80 dBA at 15 meters from the vehicle pathway centerline. These controls are implemented through regulatory controls on truck manufacturers.

State

The State of California has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure, as shown in **Figure 4.11-2**. The State of California also establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the



	Normally Acceptable	Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
	Conditionally Acceptable	New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.
	Normally Unacceptable	New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.
	Clearly Unacceptable	New construction or development generally should not be undertaken.

SOURCE: State of California, Governor's Office of Planning and Research, 1998.

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Figure 4.11-2
Land Use Compatibility for Community Noise Environment

state pass-by standard is consistent with the federal limit of 80 dB. The state pass-by standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dBA at 15 meters from the centerline. These standards are implemented through controls on vehicle manufacturers and by legal sanction of vehicle operators by state and local law enforcement officials.

The State of California has also established noise insulation standards for new multifamily residential units, hotels, and motels that would be subject to relatively high levels of transportation-related noise. These requirements are collectively known as the California Noise Insulation Standards (Title 24, California Code of Regulations). The noise insulation standards set forth an interior standard of DNL 45 dBA in any habitable room. Where dwelling units are proposed in areas subject to noise levels greater than DNL 60 dBA, these standards require an acoustical analysis that demonstrates how such units have been designed to meet this interior standard. Title 24 standards are typically enforced by local jurisdictions through the building permit application process.

Local

In California, local regulation of noise involves implementation of general plan policies and noise ordinance standards. Local general plans identify general principles intended to guide and influence development plans, and noise ordinances set forth the specific standards and procedures for addressing particular noise sources and activities. General plans recognize that different types of land uses have different sensitivities toward their noise environment; residential areas are considered to be the most sensitive type of land use to noise, and industrial/commercial areas are considered to be the least sensitive.

Contra Costa County Noise Element

Contra Costa County does not have an adopted noise ordinance; however, the Noise Element of the Contra Costa County General Plan (Contra Costa County, 2005) sets various goals and policies that act as noise and land use compatibility guidance for projects in Contra Costa County. Most of these policies address land use compatibility for evaluating the acceptability of existing and future exterior noise levels (i.e., transportation) at new projects proposing noise-sensitive receptors (e.g., residential development) and are not directly applicable to the proposed project and alternatives. However, the following policies, which address noise levels at existing sensitive receptors and construction noise, are applicable.

- *Policy 11-7*. Public Projects shall be designed and constructed to minimize long-term noise impacts on existing residents.
- *Policy 11-8*. Construction activities shall be concentrated during the hours of the day that are not noise-sensitive for adjacent land uses and should be commissioned to occur during normal work hours of the day to provide relative quiet during the more sensitive evening and early morning periods.

Policy 11-2 also notes that the County's standard for outdoor noise levels in residential areas is 60 dB DNL, but that this level "may not be achievable in all residential areas due to economic or aesthetic constraints." These and other noise related goals and policies are found in Appendix E-2, "General Plan Goals, Policies and Programs for Contra Costa County." Noise from construction activities in Contra Costa County is considered exempt from applicable standards during daytime hours, although the County has not defined "daytime" or "normal work hours" for construction noise. Instead, the County uses project-specific conditions of approval to regulate construction noise levels for projects that require County approvals (Frazier, pers. comm., 2008).

East County Area Plan – A Portion of the Alameda County General Plan

The East County Area Plan (Alameda County, 1994, revised 2002), which is a component of the Alameda County General Plan, sets various environmental health and safety goals and objectives that apply to projects in eastern Alameda County. The following noise-related policies aim to minimize East County residents' and workers' exposure to excessive noise:

- 288. The County shall endeavor to maintain acceptable noise levels throughout East County.
- 289. The County shall limit or appropriately mitigate new noise-sensitive development in areas exposed to projected noise levels exceeding 60 dB based on the *California Office of Noise Control Land Use Compatibility Guidelines*.

These and other noise related policies are listed in Appendix E-1. The "Alameda County General Plan Goals, Policies and Programs" do not list standards for acceptable noise levels, as provided in the Alameda County Noise Ordinance (see below); however, they indicate that noise studies should be required as part of development review.

Alameda County Noise Ordinance

Alameda County policy prohibits unnecessary, excessive, and annoying noise and vibration in the county, as described in the Alameda County Ordinance Code, Title 6.0 (Health and Safety), Chapter 6.60 (Noise). The policy is to maintain quiet in areas that have low noise levels and to implement programs aimed at reducing noise in those areas within the county where noise levels are above acceptable limits. **Table 4.11-1** presents the County's acceptable exterior noise levels within residential and commercial areas that are affected by stationary noise sources. Construction activities, including construction-related traffic noise, are exempt from the Noise Ordinance provisions if the construction activities are limited to between 7:00 a.m. and 7:00 p.m., Monday through Friday, and between 8:00 a.m. and 5:00 p.m. on Saturday and Sunday. Ord. Code § 6.60.070E.

Existing Noise Environment

The noise environment in the project area is influenced primarily by agricultural operations and traffic on local roadways. Wind turbines located in the foothills south and southeast of the Los Vaqueros Reservoir can be heard by persons in close proximity (e.g. – within approximately 1,500 feet) to wind energy generation machinery, however the turbines are not a recognizable noise source beyond their immediate geographic area. Sound levels away from these noise sources can be quite low, depending on the amount of nearby human activity.

TABLE 4.11-1
ALAMEDA COUNTY EXTERIOR NOISE LEVEL STANDARDS

Category	Cumulative Minutes in any One-Hour Time Period	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Receiving Land Use – Single or Multifamily Residential, School, Hospital, Church, or Public Library Properties – Noise Level Standards (dBA)			
1	30	50	45
2	15	55	50
3	5	60	55
4	1	65	60
5	0	70	65
Receiving Land Use – Commercial Properties – Noise Level Standards (dBA)			
1	30	65	60
2	15	70	65
3	5	75	70
4	1	80	75
5	0	85	80

SOURCE: Alameda County, 2006. Alameda County Noise Ordinance, Chapter 6.60 of the Alameda County Code. Alameda County Code last updated December 2006.

Metrosonics Model db308 sound level meters were used to obtain the ambient noise level measurements. The meters were calibrated to ensure the accuracy of the measurements. Two long-term (72-hour) noise level measurements and 12 short-term (five-minute) noise level measurements were taken in the vicinity of the project sites. The noise measurement locations are shown on **Figure 4.11-3**, and the results are presented in **Table 4.11-2**. Long-term measurement results (from locations shown on Figure 4.11-3) are also graphically depicted in **Figures 4.11-4** through **4.11-9**.

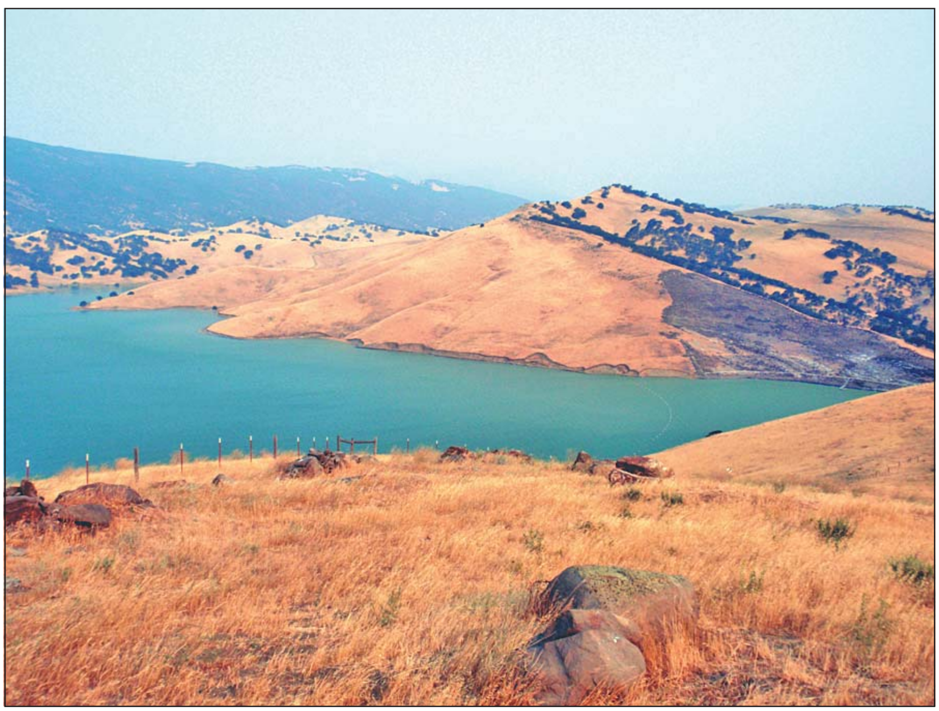
Sensitive Receptors

Some land uses are considered more sensitive to ambient noise levels than others because of the amount of noise exposure (in terms of both exposure duration and insulation from noise) and the types of activities typically involved. Residences, hotels, schools, rest homes, and hospitals are generally more sensitive to noise than commercial and industrial land uses. The closest sensitive receptors to each project component are described below and shown on Figure 4.11-3.

Alternative 1

The closest sensitive receptor to the Los Vaqueros Reservoir Expansion/Dam Modification site is a single residence located along Los Vaqueros Road about 2 miles south of the reservoir. There are also 12 residences on the ridge west of the watershed near Morgan Territory Road, about 1.6 miles from the reservoir and 3 miles from the reservoir dam site. In addition, there are several residences approximately 2.5 miles northeast of the expanded dam site, located off Silver Hills Drive near the north entrance to the watershed that may also be sensitive receptors affected by some construction noise.

PHOTOGRAPH 3. View from Vista Grande Trail looking southeast toward San Joaquin County (October 2008)



PHOTOGRAPH 4. View from Eastside Trail looking northwest toward the dam and borrow area (July 2008)

SOURCE: ESA, 2006

Figure 4.14-3
Site Photographs

TABLE 4.11-2
EXISTING NOISE ENVIRONMENT AT PROJECT SITES

Location	Time Period	Leq (dB)	Noise Sources
Long-Term Location 1: 50 feet from corner of Newport and SR 4 - About 50 feet from Delta-Transfer Pipeline and 5,000 feet from the New Western Substation.	24-hour CNEL measurements were: Wednesday 3/28/07: 72 Thursday 3/29/07: 73 Friday 3/30/07: 73	Hourly Leq ranged from: 65 – 70	Unattended noise measurements do not specifically identify noise sources.
Long-Term Location 2: 50 feet from SR 4 and near Old River Intake and Pump Station. About 4,500 feet from the new Delta Intake and Pump Station.	24-hour CNEL measurements were: Wednesday 3/28/07: 71 Thursday 3/29/07: 70 Friday 3/30/07: 70	Hourly Leq ranged from: 62 – 69	Unattended noise measurements do not specifically identify noise sources.
Short-Term Location 1: 50 feet from the corner of Discovery Bay and SR 4 - About 50 feet from Delta-Transfer Pipeline	5 Minutes 3/27/07 11:38	67.2	• Traffic at light • Wind
Short-Term Location 2: 50 feet from corner of Newport and SR 4 - About 50 feet from Delta-Transfer Pipeline and 5,000 feet from the New Western Substation.	5 Minutes 3/27/07 11:51	69.3	• Traffic 55 mph • Wind
Short-Term Location 3: 50 feet from corner of Bixler and SR 4 - About 50 feet from Delta-Transfer Pipeline	5 Minutes 3/27/07 12:12	70.1	• Traffic at light • Wind
Short-Term Location 4: Corner of SR 4 and Byron Highway - About 3,500 feet from Delta-Transfer Pipeline	5 Minutes 3/27/07 12:27	74.2	• Traffic at light • Street Cleaner 78 dB • Westside Concrete • Wind
Short-Term Location 5: 50 feet from the corner of Camino Diablo and Vasco Road - About 50 feet from Transfer-Bethany Pipeline and 9,000 feet from the stockpile area	5 Minutes 3/27/07 14:19	66.2	• Traffic at light • Wind
Short-Term Location 6: 50 feet from Vasco Road – About 1,500 feet from Transfer-Bethany Pipeline and 23,000 feet from the Expanded Dam area	5 Minutes 3/27/07 14:36	75.1	• Traffic 65 mph • Wind
Short-Term Location 7: Nearest parking lot to Los Vaqueros Dam – About 50 feet from Transfer-LV Pipeline and 900 feet from the Expanded Dam area	5 Minutes 3/27/07 14:56	46	• Cows – 50.4 dB • Dropped pen – 58 dB • Wind
Short-Term Location 7: Nearest parking lot to Los Vaqueros Dam – About 50 feet from Transfer-LV Pipeline and 900 feet from the Expanded Dam area	5 Minutes 3/27/07 15:01	45.5	• Cows – 50.4 dB • Wind
Short-Term Location 8: 50 feet from corner of Camino Diablo and Walnut Boulevard – About 50 feet from Transfer-LV Pipeline	5 Minutes 3/27/07 15:15	53	• Traffic 55 mph • Wind

TABLE 4.11-2 (Continued)
EXISTING NOISE ENVIRONMENT AT PROJECT SITES

Location	Time Period	Leq (dB)	Noise Sources
Short-Term Location 9: Near LT2. 50 feet from SR 4 and near Old River Intake and Pump Station. About 4,500 feet from the new Delta Intake and Pump Station.	5 Minutes 3/27/07 16:05	69.6	• Traffic 45 mph • Wind
Short-Term Location 10: 50 feet from Kellogg Creek Road - About 50 feet from Delta-Transfer Pipeline	5 Minutes 4/02/07 10:08	49	• Traffic on SR 4 in distance • Wind
Short-Term Location 11: 50 feet from Byron Highway and Hoffman Lane - About 50 feet from Delta-Transfer Pipeline	5 Minutes 4/02/07 10:22	63.4	• Traffic on Byron Highway • Two cars on Hoffman • Wind
Short-Term Location 12: 50 feet from Hoffman Lane - About 50 feet from Delta-Transfer Pipeline	5 Minutes 4/02/07 10:30	56.9	• Traffic on SR 4 in distance • Tractor in adjacent field • Truck 72 dB • Wind

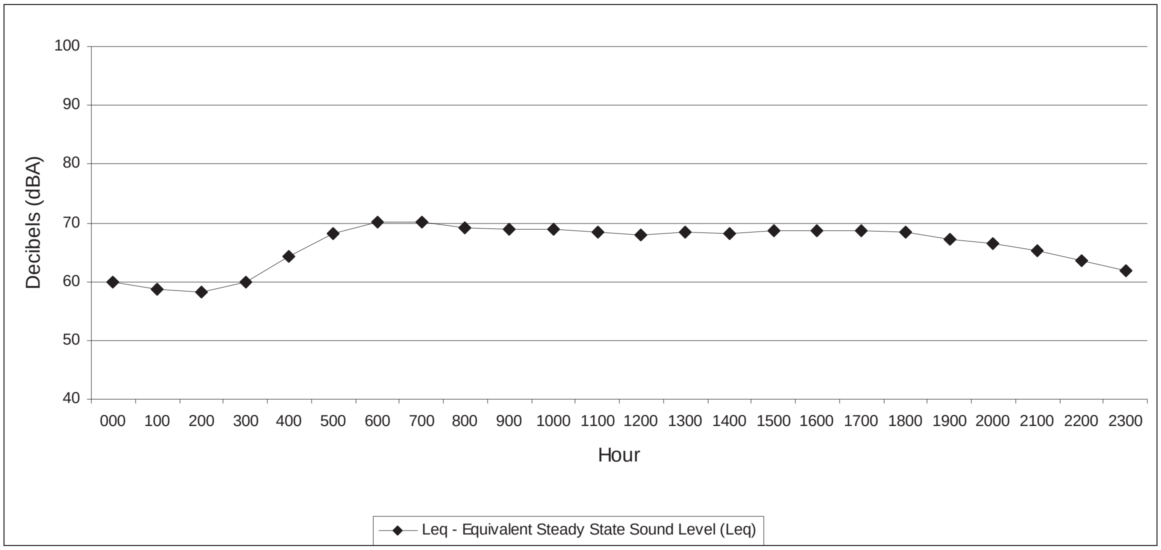
SOURCE: ESA, 2007.

The new Delta Intake and Pump Station would be constructed along Old River within the siting zone shown on Figure 3-14, and could be as close as 500 feet or as far as 1,000 feet from an existing residence located on the east side of Old River, outside the levee. For purposes of impact assessment, this residence is considered to be located 500 feet east of the anticipated construction.

Conveyance facilities for Alternative 1 include the following facilities and associated sensitive receptors:

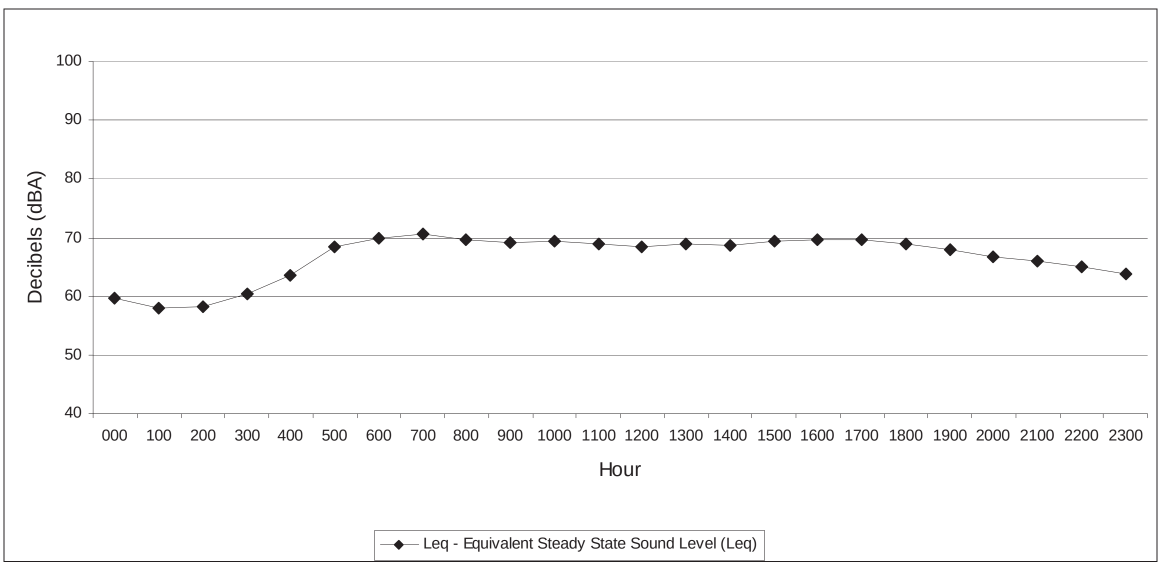
- The Delta-Transfer Pipeline would pass as close as 50 feet from the closest homes on SR 4, Bixler Road, Kellogg Creek Road, and Hoffman Lane, including construction along SR 4 south of the Discovery Bay residential community.
- The Transfer Facility Expansion would be about 1,450 feet east of the nearest residence on Walnut Boulevard.
- The Transfer-LV Pipeline would pass as close as 50 feet from homes on along Camino Diablo and Walnut Avenue.
- The Transfer-Bethany Pipeline would pass as close as 50 feet from homes on Armstrong Road.

Proposed additional electrical power supply lines would be extended to the existing Old River Intake and Pump Station, new Delta Intake and Pump Station, and Expanded Transfer Facility and would largely be located in close proximity to proposed project pipelines, affecting the same sensitive receptors as described above.



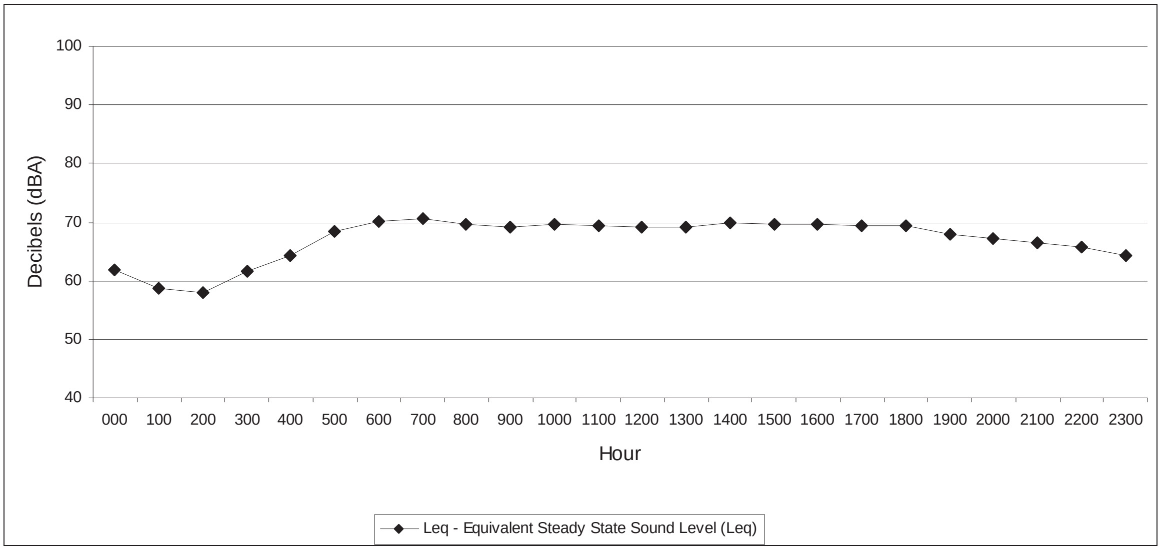
Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.11-4
24-Hour Noise Measurement – Site LT1
Wednesday March 28, 2007



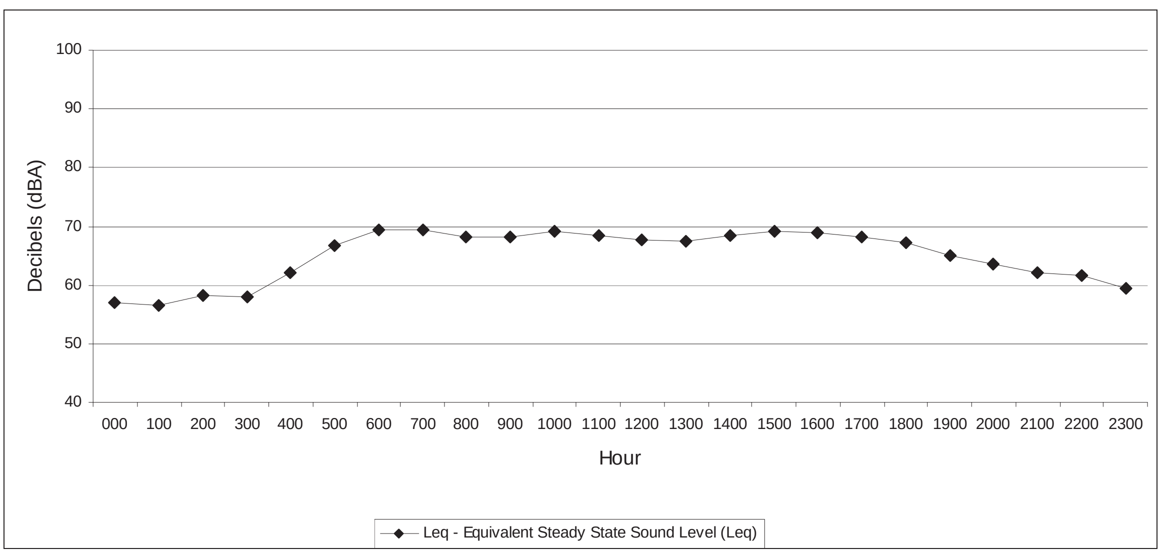
Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.11-5
24-Hour Noise Measurement – Site LT1
Thursday March 29, 2007



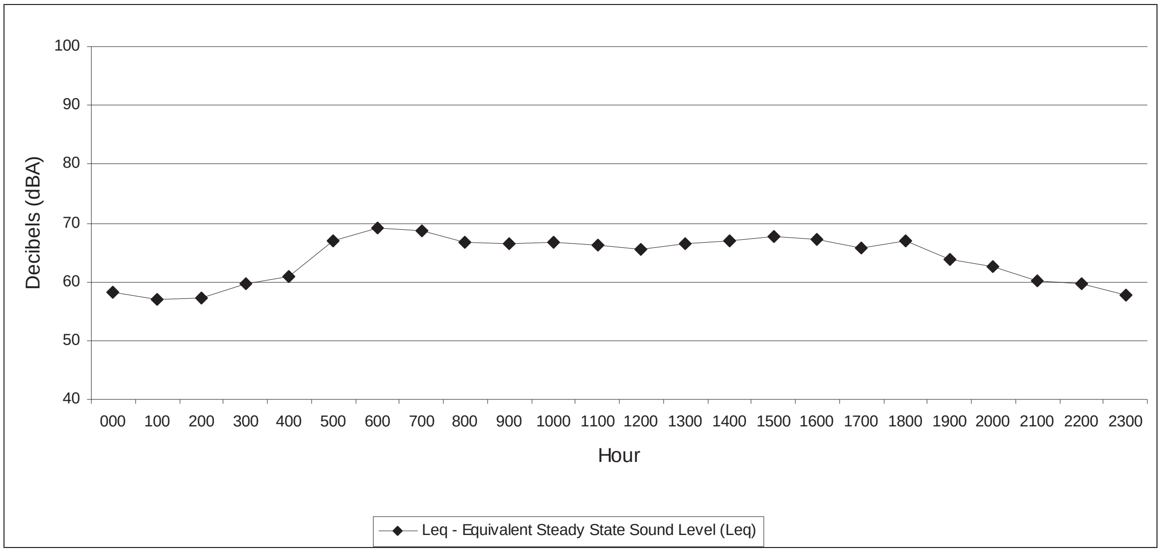
Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.11-6
24-Hour Noise Measurement – Site LT1
Friday March 30, 2007



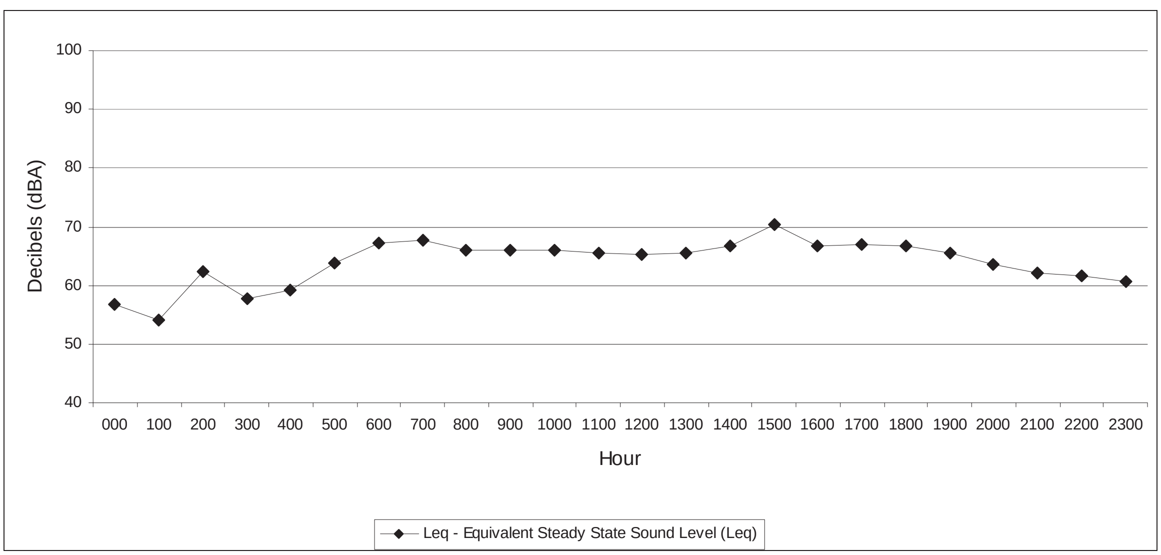
Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.11-7
24-Hour Noise Measurement – Site LT2
Wednesday March 28, 2007



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.11-8
24-Hour Noise Measurement – Site LT2
Thursday March 29, 2007



Los Vaqueros Reservoir Expansion Project. 201110

Figure 4.11-9
24-Hour Noise Measurement – Site LT2
Friday March 30, 2007

The nearest rural residences to the Power Option 1 (Western only) are about 1,275 feet away from the proposed Western substation and upgraded transmission line to be extended to the new Delta Intake Pump Station. The substation under Power Option 2 (Western & PG&E) would be located within the CCWD watershed property line, approximately 500 feet west of the nearest residences located on Silver Hills Drive.

Recreation Facilities associated with expansion of the reservoir to 275 TAF include a Marina Complex and an Interpretive Center located west of the enlarged dam; relocated and new hiking trails and access; and other facilities (fishing piers, picnic areas, restrooms and parking). All of these facilities would be located within the CCWD watershed property line. The nearest sensitive receptor would be a residence located southeast of the corner of Camino Diablo and Walnut Boulevard, over one mile from anticipated new recreational facilities.

Alternative 2

The potential noise impacts on sensitive receptors associated with Alternative 2 would be exactly the same as those described above for Alternative 1 because Alternative 2 includes all the same proposed facilities and construction activities in the same locations.

Alternative 3

Sensitive receptors and noise impacts for Alternative 3 would be largely the same as those outlined for Alternative 1 with three substantive differences:

- The existing Old River Intake and Pump Station would be expanded under this alternative but not under Alternative 1. Construction activity to expand this facility would occur approximately 3,000 feet from the nearest residence located to the northwest along SR 4 (see Figure 14.11-3).
- Alternative 3 would not include construction of a new Delta Intake and Pump Station, so there would be no exposure of sensitive receptors to noise associated with this facility as there would be under Alternative 1.
- Alternative 3 would not include the Transfer-Bethany pipeline, so there would be no exposure of sensitive receptors to noise associated with this facility.

The closest sensitive receptors to the remaining project components would be the same as described above for Alternative 1.

Alternative 4

Alternative 4 would include a dam raise for a 160 TAF reservoir that would be smaller and involve less construction material and construction activity than the dam raise required under Alternative 1 for the 275 TAF reservoir. Alternative 4 would involve construction of the same dam appurtenance facilities as Alternative 1. Under Alternative 4, the closest sensitive receptor to the Expanded Los Vaqueros Reservoir Expansion/Dam Modification site is the single residence located along Los Vaqueros Road 1.5 miles to the south. In addition, there are also several residences approximately 2.5 miles northeast of the expanded dam site, located off Silver Hills Drive.

There are twelve additional residences located near Morgan Territory Road about 2.5 miles southwest of the reservoir and 3 miles from the dam raise that may also be sensitive receptors affected by some construction noise. Like Alternative 1, blasting would be used at the shell borrow area adjacent to the dam, although less material would be excavated under this alternative. Blasting would not result in a significant impact on any of the nearby residences. The closest sensitive receptors to the 160 TAF Reservoir Expansion core borrow area are residences located east of the Watershed boundary, about 2,000 feet north of the 160 TAF borrow site.

Alternative 4 would not include expansion of the existing Old River Pump Station or construction of the new Delta Intake and Pump Station, any of the proposed conveyance facilities, or any new power supply facilities. Also, fewer recreation facilities would be relocated or expanded within CCWD watershed lands under Alternative 4 than under Alternative 1. Construction of the new and relocated recreation facilities would not increase noise levels at any sensitive receptor sites.

4.11.2 Environmental Consequences

Methodology

Noise impacts are assessed based on a comparative analysis of the noise levels resulting from the alternative and the noise levels under existing conditions. Analysis of temporary construction noise effects is based on typical construction phases and equipment noise levels and attenuation of those noise levels due to distances between the construction activity and the sensitive receptors near the sources of construction noise.

Vibration from construction is evaluated for potential impacts at sensitive receptors. Typical activities evaluated for potential building damage due to construction vibration include demolition, pile driving, and drilling or excavation in close proximity to structures. The ground-borne vibration is also evaluated for perception to eliminate annoyance. Vibration propagates according to the following expression, based on point sources with normal propagation conditions:

$$PPV_{equip} = PPV_{ref} \text{ x } (25/D)^{1.5}$$

Where PPV (equip) is the peak particle velocity in inches per second of the equipment adjusted for distance, PPV (ref) is the reference vibration level in inches per second at 25 feet, and D is the distance from the equipment to the receiver. The PPV is defined as the maximum instantaneous positive or negative peak of the vibration and is often used in monitoring vibration because it is related to the stresses experienced by structures.

To determine the potential for annoyance, the RMS vibration level (L_v) at any distance (D) is estimated based on the following equation:

$$L_v(D) = L_v(25 \text{ ft}) – 30\log(D/25)$$

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines, on thresholds used in previously certified CCWD EIRs, on the guidance provided by the Contra Costa County and Alameda County General Plans and the Alameda County Noise Ordinance, and on California Department of Transportation recommendations regarding vibration impacts. These thresholds also encompass the factors taken into account under NEPA to assess environmental impact of an action in terms of the context and the intensity of its effects. CEQA thresholds with respect to airports or private airstrips are not relevant to the project and are therefore not included here. The proposed project or an alternative was determined to result in a significant effect on the noise environment as follows:

Short-Term Construction Noise Impacts. Short-term construction noise impacts from construction in Contra Costa County would be considered significant if construction activities would be conducted outside of normal working hours and if noise levels would result in noticeable noise increase (i.e., 5 dBA or greater) in ambient noise levels at nearby noise-sensitive land uses (sensitive receptors). Contra Costa County does not have noise-related performance standards or definitions of “daylight” or “normal” working hours, but for purposes of this impact analysis normal working hours are considered to be 7 a.m. to 7 p.m. Monday through Friday, and 8 a.m. to 5 p.m. on Saturday and Sunday -- the same as the exempt construction hours in Alameda County.

Similarly, for construction activities within Alameda County, in accordance with the Alameda County Noise Ordinance, short-term noise impacts from construction would also be considered significant if construction activities would be conducted outside the daytime hours of 7 a.m. to 7 p.m. Monday through Friday, or 8 a.m. to 5 p.m. on Saturday and Sunday, and if noise levels would result in noticeable noise increase (i.e., 5 dBA or greater) in ambient noise levels at nearby noise-sensitive land uses.

Traffic Noise Impacts. Long-term traffic noise impacts would be significant if project-generated traffic would increase the average daily noise levels at a noise-sensitive land use by more than 5 dBA, or cause the overall level to exceed the “normally acceptable” standard for land use compatibility established by the Contra Costa County and Alameda County General Plans (60 dBA L_{dn} for the most noise-sensitive land uses considered by each jurisdiction in its general plan).

Stationary and Area-Source Impacts. Long-term stationary and area source impacts would be significant if the proposed project or alternative results in an substantial permanent increase in ambient noise levels (i.e., 5 dBA) at noise-sensitive receptors (i.e., residences) as this would result in a noticeable noise increase above ambient levels, or causes the overall total noise level to exceed the “normally acceptable” standards for land use compatibility described above. In addition, for project stationary source noise in Alameda County, the associated noise levels would be considered significant if the hourly exterior Leq would exceed the standards in Table 4.11-1.

Vibration Impacts. For most structures, a peak particle velocity (PPV) threshold of 0.5 inch per second is sufficient to avoid structural damage; however, the California Department of Transportation recommends a more conservative threshold of 0.2 inch per second PPV for residential buildings. Impacts would be considered significant if 0.2 inch per second PPV were reached at nearby vibration-sensitive receptors. In addition, an air-overpressure greater than 133 dBL is considered by the U.S. Bureau of Mines to be significant.

Impact Summary

Table 4.11-3 provides a summary of the impact analysis for issues related to noise based on the project construction and operation scenarios described in Chapter 3.

TABLE 4.11-3
SUMMARY OF IMPACTS – NOISE

	Project Alternatives			
Impact	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.11.1: Construction of facilities under the proposed project and alternatives could generate noise levels that exceed the Contra Costa County or Alameda County noise standards at nearby sensitive receptors if construction activities are carried out during noise-sensitive hours, causing sleep disturbance and/or annoyance.	LSM	LSM	LSM	LSM
4.11.2: Operation of the project and alternatives would generate traffic, stationary source, and area source noise similar to existing noise associated with operation of Los Vaqueros Reservoir system and would not exceed County noise requirements.	LS	LS	LS	LS
4.11.3: Project construction would not expose persons to or generate excessive ground-borne vibration or ground-borne noise levels.	LS	LS	LS	LS
4.11.4: The proposed project or alternatives would not make a cumulatively considerable contribution to noise levels during either construction or operation.	LS	LS	LS	LS

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no project construction work would take place and no construction-generated noise would result. No new stationary sources of noise would be created, and there would be no new source of ground-borne vibration or noise.

Impact 4.11.1: Construction of facilities under the proposed project and alternatives could generate noise levels that exceed the Contra Costa County or Alameda County noise standards at nearby sensitive receptors if construction activities are carried out during noise-sensitive hours, causing sleep disturbance and/or annoyance. (Less than Significant with Mitigation)

Neither Contra Costa County nor Alameda County applies noise standards to daytime construction noise. If project construction proceeded at night in the vicinity of sensitive receptors, however, the project could cause significant impacts by causing 5-dBA or greater increases in noise at sensitive receptors.

Construction noise levels at and near the construction areas would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. Construction-related material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips and types of vehicles used. In addition, certain types of construction equipment and construction activities generate impulsive noises (such as pile driving), which can be particularly annoying. **Table 4.11-4** shows typical noise levels during different construction stages. **Table 4.11-5** shows typical noise levels produced by various types of construction equipment.

TABLE 4.11-4
TYPICAL CONSTRUCTION NOISE LEVELS

Construction Phase	Noise Level (dBA, Leq)[a]
Ground Clearing	843
Excavation	89
Foundations	78
Erection	85
Finishing	89

[a] Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.

SOURCE: U.S. EPA, 1971.

TABLE 4.11-5
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, Leq at 50 feet)
Dump Truck	88
Portable Air Compressor	81
Concrete Mixer (Truck)	85
Scraper	88
Jackhammer	88
Dozer	87
Paver	89
Generator	76
Pile Driver	101
Backhoe	85
Rock Drill	98

SOURCE: Cunniff, 1977.

Blast noise occurs at a broad range of frequencies and the highest-energy blast noise usually occurs at frequencies below that of human hearing (<20 Hz). Since blasting activities generate noise at frequencies inaudible by the human ear, it will not be discussed further under this impact. The air-overpressure from blasting, however, will be analyzed under Impact 4.11.3.

Noise from construction activities generally attenuates at a rate of 4.5 to 7.5 dBA per doubling of distance; therefore, other sensitive receptors in the study area would be exposed to construction noise at incrementally lower levels than the noise levels expected at the closest residences. Noise levels are analyzed below with an assumed attenuation rate of 7.5 dBA because construction activities would attenuate at a rate similar to a point source over an absorptive ground surface.

Alternative 1

Los Vaqueros Reservoir Expansion

Expansion of Los Vaqueros Reservoir and the associated Dam Raise would require extensive excavation as well as rock drilling in preparation for blasting at the borrow area located west (upstream) of the Dam during construction. Excavation and rock drilling can generate noise levels of up to 89 dBA Leq and 98 dBA Leq at 50 feet, respectively. With the nearest residence approximately 1.5 miles (7,920 feet) west of the reservoir along Los Vaqueros Road, noise levels generated during excavation and rock drilling activities would attenuate by distance to 34 dBA Leq and 43 dBA Leq, respectively, at this residence. Construction noise at these levels would not be greater than existing noise levels in the vicinity of the reservoir (45.5 Leq measured at Short-Term Location 7, as described in Table 4.11-2).

For the residences located along Silver Hills Drive, 2.5 miles northeast of the dam, excavation and rock drilling noise attenuate by distance to less than noticeable levels (29 dBA Leq and 38 dBA Leq, respectively). For the 12 residences located along Morgan Territory Road, 3 miles west of the dam, excavation and rock drilling noise would be reduced by the distance to less than noticeable levels (27 dBA Leq and 36 dBA Leq, respectively).

Table 4.11-6 summarizes the anticipated effects of excavation and rock drilling upon sensitive receptors located 1.5 miles to 3.0 miles west of the dam raise construction.

New Delta Intake and Pump Station

During construction of the new Delta Intake and Pump Station, a residence located as close as 500 feet to the east would be exposed to approximately 66 dBA Leq sound levels during pile driving (required for installation of the cofferdam to allow construction in the river at the new intake site) based on attenuation by distance and tall earthen levees. Pile driving is among the loudest of the proposed construction activities. Existing noise levels measured at Long-Term Location 2 (62 to 69 dBA Leq, described in Table 4.11-2) would attenuate by distance to approximately 40 dBA Leq at the residence east of the New Delta Intake and Pump Station, and would be representative of ambient noise levels at this residence. Although the single residence would be buffered from some construction noise by tall earthen levees, pile driving noise at 66 dBA Leq would be substantially greater (approximately 26 dBA increase) than existing noise

TABLE 4.11-6
LOS VAQUEROS RESERVOIR EXPANSION NOISE AT THE NEAREST SENSITIVE RECEPTORS IN THE PROJECT VICINITY

Nearest Sensitive Receptor	Excavation Hourly Leq (dBA) at Receptor based on Excavation	Greater than 5 dBA increase and outside normal work hours (potentially significant)? (Yes or No)	Rock Drilling Hourly Leq (dBA) at Receptor based on Distance Alone	Greater than 5 dBA increase and outside normal work hours (potentially significant)? (Yes or No)
1.5 miles west of reservoir	34	No	43	No
2.5 miles northeast of the reservoir	29	No	38	No
3 miles west of reservoir	27	No	36	No

SOURCE: ESA, 2008.

levels at this nearby sensitive receptor location. In this same location, excavation and ground clearing noise would result in approximately 54 dBA Leq, which would also be substantially greater the ambient noise environment at this sensitive receptor.

Conveyance Facilities

Because portions of the Delta-Transfer, Transfer-LV, and Transfer-Bethany pipeline alignments are located within 50 feet of single residences as well as residential areas, some noise-sensitive receptors would be located within 50 feet of pipeline trench excavation and construction activities. Sensitive receptors, such as residences, located within 50 feet of pipeline construction areas would be exposed to 89 dBA Leq during excavation, which is anticipated to be the loudest of anticipated construction activities associated with pipeline trench construction. Construction noise at these levels would be substantially greater (approximately 40 dBA increase) than existing noise levels (49 Leq measured at Short-Term Location 10, as described in Table 4.11-2) at these nearby sensitive receptor locations.

Construction of the Transfer-Bethany Pipeline would include tunneling and trenching in the area south of the Byron Airport and toward Bethany Reservoir. Two Bethany connection options (Westside and Eastside) would both likely involve rock drilling in order to construct pipeline tunnels. The boring pit for the Westside Option tunnel is located approximately 3,000 feet south of an existing residence. Tunnel construction activities, including rock drilling, could expose this sensitive receptor to noise levels of 54 dBA Leq. Construction noise at these levels would be less than existing noise levels (75.1 dBA Leq measured at Short-Term Location 6, as described in Table 4.11-2) at these nearby sensitive receptor locations. Additional boring pits for both the Westside Option (1 additional boring pit) and Eastside Option (4 smaller boring pits) are not located in proximity to residences or other sensitive receptors.

Expansion of the Transfer Facility would include pump capacity upgrades at the existing pump station along with the construction of additional pumping facilities and a new reservoir adjacent to the existing facilities. Construction of these facilities would occur approximately 1,500 feet from the nearest residence on Walnut Boulevard, and would result in this residence being exposed to 52 dBA Leq during periods of excavation and other construction activity. Construction noise at these levels would not be greater than existing noise levels at these nearby sensitive receptor locations (53 Leq measured at Short-Term Location 8, as described in Table 4.11-2).

Power Supply

Construction of the proposed powerlines under either Power Option 1 (Western only) or Power Option 2 (Western & PG&E) would consist of vegetation removal at the pole site, auguring the pole holes, setting the framed poles, backfilling, and stringing the overhead distribution lines. In addition, pull and tension sites during conductor installation would be required. Construction of a substation under either option would include vegetation removal, grading, excavation, and construction of subsurface footings and concrete slabs for aboveground structures and equipment. Typical noise levels at 50 feet from the source for some of the heavy pieces of construction equipment that would be required to construct these electrical power facilities are listed in Table 4.11-4. Excavation would be the loudest construction activity at 89 dBA Leq at 50 feet (whereas auguring would generate 85 dBA Lmax at 50 feet (FHWA, 2006)). The nearest sensitive receptor for Power Option 1 (Western Only) is 1,275 feet away from the construction area and would be exposed to 54 dBA Leq during excavation, which would be substantially greater (5 dBA increase) than ambient noise levels (49 dBA Leq measured at Short-Term Location 10, as described in Table 4.11-2). The nearest sensitive receptor for Power Option 2 (Western & PG&E) is 500 feet away from the construction area and would result in 64 dBA Leq during excavation, which would be substantially greater (11 dBA) than ambient noise levels (53 Leq measured at Short-Term Location 8, as described in Table 4.11-2).

Under either power option, impacts from construction of the power line between the existing Western substation south of the Harvey O. Banks Pumping Plant and the Delta facilities would be somewhat less than as those analyzed for the Delta-Transfer Pipeline, above, although the facilities would be co-aligned, because the power line installation does not involve the trench excavation and trenching activities required for pipeline construction. Instead, individual power pole locations would be augured at distances of 200 to 300 feet, and lines strung between the poles.

Recreation Facilities

Recreation facilities associated with expansion of the reservoir to 275 TAF include a Marina Complex and an Interpretive Center located west of the enlarged dam; relocation of existing hiking trails and access roads; installation of additional access roads and hiking trails; and the relocation and/or addition of other facilities (i.e., fishing piers, picnic areas, restrooms and parking). All of these facilities would be located within the CCWD watershed property line. The nearest sensitive receptor would be a residence located southeast of the corner of Camino Diablo and Walnut Boulevard, over one mile from the relocated and new recreational facilities. Since pile-driving (the loudest of construction activities for the recreational facilities) construction noise for marina development would attenuate to 50 dBA Leq, construction noise would be less than the existing noise levels (53 Leq measured at Short-Term Location 8, as described in Table 4.11-2) at this receptor and would not be noticeable.

Summary

Noise from construction of pipeline segments, the New Delta Intake and Pump Station, and power supply facilities of Alternative 1 would be significant if the construction occurred outside of the specified “normal” working hour time periods of 7 a.m. to 7 p.m. Monday through Friday, and 8 a.m. to 5 p.m. on Saturday and Sunday because these activities could result in noise increases of 5 dBA or more over ambient noise levels at sensitive noise receptors (residences) located in proximity to the construction areas.

Alternative 2

The noise generated by construction of Alternative 2 would be the same as discussed above for Alternative 1 because Alternative 2 includes construction of the same facilities as does Alternative 1. The noise impacts would be significant if the construction occurred outside of daytime hours.

Alternative 3

The noise generated by construction of Alternative 3 would be the same as discussed above for Alternative 1 with three substantive differences:

- Expansion work at the Old River Intake and Pump Station would occur approximately 3,000 feet from the nearest residence to the northwest along SR 4. This expansion work would not require pile driving, and given the distance to the nearest residence this activity would not result in construction noise levels above ambient levels, as discussed further below.

- Alternative 3 would not include a new Delta Intake and Pump Station, which would avoid pile driving and other construction approximately 500 feet from the existing residence across Old River on Victoria Island.

- Alternative 3 would not include a Transfer-Bethany pipeline, so there would be no exposure to sensitive receptor locations associated with this pipeline and its tunnel components.

During construction for the Old River Intake and Pump Station Expansion, which would occur 3,000 feet from noise-sensitive land uses to the northwest, the sensitive receptors would be exposed to 45 dBA Leq during the excavation and finish work. Construction at these sound levels would not be a significant impact on the nearest residences because the existing noise environment is dominated by traffic on SR 4, with monitored hourly Leqs that ranged from 65 to 70 dBA (Table 4.11-2, Long-Term Location 1) in the vicinity of the receptors.

Alternative 4

The noise generated by construction of Alternative 4 would be substantially less than that generated by construction of Alternative 1 because Alternative 4 would not include facilities outside CCWD watershed property lines. Alternative 4 would include a dam raise for a 160 TAF reservoir expansion that would be smaller and involve less construction activity than the dam raise required under Alternative 1 for the 275 TAF reservoir. Alternative 4 would involve construction of the same dam appurtenance facilities as Alternative 1. Under Alternative 4, the closest sensitive receptor to the Los Vaqueros Reservoir Expansion/Dam Modification site is the single residence located along Los Vaqueros Road 1.5 miles to the south. As with Alternative 1, there are several residences about 2.5 miles northeast of the dam raise site on Silver Hills Drive, and the twelve residences located 3 miles west of the dam raise site near Morgan Territory Road. They would notice but not be adversely affected by the 160 TAF Reservoir Expansion because borrow materials would not be excavated by blasting activities at the shell borrow area adjacent to the dam, as would occur under Alternative 1. The closest sensitive receptors to the 160 TAF Reservoir Expansion core borrow area are residences located east of the Watershed boundary, about 2,000 feet to the north of the 160 TAF borrow site; excavation at the core borrow area would result in 49 dBA Leq during excavation, which would be less than ambient noise levels (53 Leq measured at Short-Term Location 8, as described in Table 4.11-2).

Alternative 4 would not include modifications to the existing Old River Pump Station or construction of the new Delta Intake and Pump Station, any of the proposed conveyance facilities, or any new power supply facilities. Also, fewer recreation facilities would be relocated or expanded within CCWD watershed lands under Alternative 4 than under Alternative 1. Construction of the new and relocated recreation facilities would not increase noise levels at any sensitive receptor sites.

Mitigation Measures

Measure 4.11.1a: To avoid noise-sensitive hours of the day and night, construction will be limited to the hours between 7 a.m. to 7 p.m. Monday through Friday, and 8 a.m. to 5 p.m. on Saturday and Sunday for the following facilities, construction activities and project areas:

- Alternatives 1, 2, 3, or 4: Construction of any facilities in those areas that are 3,000 feet or less from sensitive residences. At 3,000 feet, excavation activities would attenuate to 45 dBA and would be less than the quietest existing noise environment measured and depicted in Table 4.11-2 and would not be noticeable.

Measure 4.11.1b: To further address the impact of construction for all alternatives, construction contractors will implement the following:

- Signs will be posted at all construction site entrances to the property when project construction begins to inform all contractors/subcontractors, their employees, agents, material haulers, and all other persons at the applicable construction sites of the basic requirements of Mitigation Measures 4.11.1a, 4.11.1c, and 4.11.1d.

- Signs will be posted at the construction sites that include permitted construction days and hours, a day and evening contact number for the job site, and a contact number in the event of problems.

- An onsite complaint and enforcement manager will respond to and track complaints and questions related to noise.

Measure 4.11.1c: To reduce noise impacts due to construction for all alternatives, construction contractors will be required to implement the following measures:

- During construction, the contractor will outfit all equipment, fixed or mobile, with properly operating and maintained exhaust and intake mufflers, consistent with manufacturers' standards.
- Impact tools (e.g., jackhammers, pavement breakers, and rock drills) used for construction will be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust will be used. External jackets on the tools themselves will be used where feasible. Quieter procedures, such as use of drills rather than impact tools, will be used whenever construction occurs within 3,000 feet of sensitive residences.
- Stationary noise sources will be located as far from adjacent sensitive receptors as possible.

Measure 4.11.1d: For all alternatives, no amplified sources (e.g., stereo "boom boxes") will be used in the vicinity of residences during project construction.

Measure 4.11.1e: To further reduce less than significant pile driving noise impacts at the Delta Pump Station facilities under all alternatives, CCWD shall require construction contractors to implement "quiet" pile-driving technology (such as sonic or vibratory pile-driver use; pre-drilling of piles; jetted pile-driving) where feasible, with consideration of geotechnical and structural requirements and conditions.

Impact Significance after Mitigation: Less than Significant.

Impact 4.11.2: Operation of the project and alternatives would generate traffic, stationary source, and area source noise similar to existing noise associated with operation of the Los Vaqueros Reservoir system and would not exceed County noise requirements. (Less than Significant)

Alternative 1

Long-term operation of the proposed facilities under Alternative 1 would generate traffic volumes similar to the existing traffic within the project area. With respect to facilities operation and maintenance, there would be only a few (less than 10) additional employees added to operate the expanded system; as with the existing system most facility operations would be automated and monitored remotely. In addition, the expanded system would require only limited additional maintenance worker trips. For the most part, the new or expanded facilities would be integrated into or adjacent to existing facilities, requiring monitoring and maintenance at the same locations and at similar levels to the existing system. Facility operation would not generate much additional traffic that would contribute appreciably to noise levels in the project area. While portions of the proposed pipelines and powerlines would be located near residences, periodic inspection and maintenance of these facilities would not generate significant noise.

With respect to traffic associated with visitor use of the expanded recreation facilities at Los Vaqueros Reservoir under Alternative 1, Impact 4.9.6 in Section 4.9 – Traffic and Circulation discusses the anticipated changes in recreation traffic due to relocation of the Marina Complex from the south end of the reservoir to the north end along with the addition of an additional interpretive center and expanded hiking trails. While some increase in visitor use of the recreation facilities is anticipated under these three alternatives, the associated increase in daily traffic on local roadways would not be sufficient to appreciably affect ambient noise levels.

Noise generated the new Delta Intake and Pump Station would be similar to the noise levels at the existing Old River Intake and Pump Station. The new Delta Intake and Pump Station could be located as close as 500 feet to the nearest sensitive receptor compared to the existing Old River Intake and Pump Station, which is 3,000 feet from the nearest residence. Without proper noise control or enclosure, pump station equipment could result in noise levels in the range of 78 to 88 dBA at 3 to 5 feet from the source depending on the type and size (U.S. EPA, 1971). Existing noise levels measured at Long-Term Location 2 (62 to 69 dBA Leq, described in Table 4.11-2) would attenuate by distance to about 40 dBA Leq at the residence east of the new Delta Intake and Pump Station, and would be representative of ambient noise levels at this residence. Noise from the pump station would attenuate between the new Delta Intake and Pump Station and the nearby residence as a result of distance and the presence of earthen levees to less than 38 dBA Leq, which would be less than the ambient noise levels at this residence and would not be noticeable.

Summary

Operation of the project and alternatives would generate traffic, stationary source, and area source noise similar to existing noise associated with the current operation of Los Vaqueros Reservoir. The new Delta Intake and Pump Station would generate noise levels less than the existing ambient noise levels and would be less than significant.

Alternative 2

Operational noise effects under Alternative 2 would be exactly the same as those described for Alternative 1, since Alternative 2 includes all the same facilities and operations. As for Alternative 1, operational noise effects would be less than significant.

Alternative 3

Operational noise effects under Alternative 3 would be similar to those described for Alternative 1 although Alternative 3 would generate even less operational noise because it involves expansion of the existing Old River Intake and Pump Station instead of construction or operation of the new Delta Intake and Pump Station. Noise generated by the expanded Old River Intake and Pump Station would be similar to that of the existing facility. The noise environment for these residences would continue to be dominated by traffic noise from SR 4. Operational noise effects for Alternative 3 would be less than significant.

Alternative 4

Operational noise effects under Alternative 4 would be less than those described for Alternative 1 because this alternative involves substantially fewer new or expanded facilities. The reservoir would be expanded to 160 TAF but there would be no change in the existing intake and pumping facilities or pipeline conveyance facilities and thus no additional noise sources associated with system operations. The Marina Complex would not be relocated from the south end of the reservoir to the north end as it would under Alternative 1 and there would be no appreciable change expected in visitor use of the recreation facilities over current levels as a result of the project. Operational noise effects for Alternative 4 would be less than significant.

Mitigation: None required.

Impact 4.11.3: Project construction would not expose persons to or generate excessive ground-borne vibration or ground-borne noise levels. (Less than Significant)

Alternative 1

As shown in **Table 4.11-7**, use of heavy equipment during construction generates vibration levels of up to 0.644 PPV or 104 RMS (pile driver) at a distance of 25 feet. Bulldozers would generate approximately 0.089 PPV and 87 RMS at 25 feet. Pile driving required for construction of the new Delta Intake and Pump Station would occur within 500 to 3,000 feet of the nearest residence (depending on the final site location selected within the siting zone) and could generate vibration of approximately 0.007 PPV and 65 RMS. The nearest sensitive receptors to any of the proposed pipelines would be approximately 50 feet (for construction of the Delta-Transfer pipeline, Transfer-LV pipeline, and Transfer-Bethany pipeline, as previously described in the "Sensitive Receptor" discussion) from heavy equipment activity and could experience vibration levels of 0.031 PPV and 78 RMS from bulldozer operation. Tunneling activity associated with the Transfer-Bethany Pipeline is located 3,000 feet from the nearest sensitive receptor.

TABLE 4.11-7
VIBRATION VELOCITIES FOR CONSTRUCTION EQUIPMENT

Equipment Activity	PPV at 25 Feet (inches/second)[a]	RMS at 25 Feet (VDB)[b]
Pile Driver	0.644	104
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79

[a] Buildings can be exposed to ground-borne vibration levels of 0.2 PPV without experiencing structural damage.
[b] The human annoyance response level is 80 RMS.

SOURCE: FTA, 2006.

Vibration levels at these receptors would not exceed the potential building damage threshold of 0.2 PPV or the annoyance threshold of 80 RMS. Other sensitive receptors in the project vicinity would be exposed to vibration levels at incrementally lower levels than those calculated for pile driving at the new Delta Intake and Pump Station construction site.

For potential blasting activities associated with reservoir construction (to excavate needed borrow materials), the nearest noise-sensitive residence is approximately 1.5 miles (7,920 feet) west of the reservoir. Vibration levels at this substantial distance would not be noticeable. However, in regards to air-overpressure at 1.5 miles from the blast, the nearest residence would be exposed to between 87 to 107 dBL from the blast (URS, 2008). This air-overpressure is well below the 133 dBL regulatory limit used by the U.S. Bureau of Mines. The impact associated with vibration generated by construction activities would be less-than-significant, and no mitigation is required.

Alternative 2

The vibration effects that could occur under Alternative 2 would be exactly the same as those described from Alternative 1 since this alternative would involve construction of all of the same facilities as Alternative 1. As with Alternative 1, the vibration effects of facilities construction under Alternative 2 would be less than significant.

Alternative 3

The vibration effects that could occur under Alternative 3 would be exactly the same at the expanded reservoir/dam modification site as those described from Alternative 1. Under Alternative 3 there would be no construction of a new Delta Intake and Pump Station so those vibration effects would not occur. This alternative does not include the new Transfer-Bethany pipeline and thus would not result in vibration effects caused by pipeline trenching and tunneling for this facility. As with Alternative 1, the vibration effects of facilities construction under Alternative 3 would be less than significant.

Alternative 4

The vibration effects that could occur under Alternative 4 would be much less than those described under Alternative 1 because this alternative involves construction of fewer facilities. Construction under this alternative involves only dam modification for a 160 TAF reservoir expansion and relocation of impacted recreation facilities. Earthwork and possible blasting for construction of the dam raise would result in vibration effects similar to those described for Alternative 1. As with Alternative 1, the vibration effects of facilities construction under Alternative 4 would be less than significant.

Mitigation: None required.

Impact 4.11.4: The proposed project or alternatives would not make a cumulatively considerable contribution to noise levels during either construction or operation. (Less than Significant)

All Alternatives

Noise is a localized occurrence and attenuates with distance. Therefore, only other projects or activities in relatively close proximity (about ½ mile) to the project sites would have the potential to add to anticipated project-generated noise and create cumulative noise effects. As discussed in Section 4.1 – Approach to Analysis (see subsection 4.1.3 Approach to Cumulative Analysis), there are no other identified development or public works projects proposed for construction during the same timeframe as, and in close proximity to, the proposed facility sites for the Los Vaqueros Reservoir Expansion Project. Based on this review of probable future projects, Los Vaqueros Reservoir Expansion Project construction activities would not contribute considerably to any significant cumulative noise effects. In addition, as described in Impact 4.11.1, the project construction activities that would result in the greatest noise effects would occur at pipeline construction sites in the proximity of noise-sensitive receptors (for Alternatives 1, 2 and 3). Under Mitigation Measure 4.11.1a, all pipeline construction activities within 3,000 feet of residences, would be prohibited at night. Therefore, there would be no noisy nighttime construction activities that could contribute to any significant cumulative construction noise impact, even if other projects near the Proposed Project or alternative sites are proposed and approved in the future and are constructed at night. Project construction is anticipated to be completed in approximately 3 years for Alternatives 1, 2, and 3 and less for Alternative 4, after which there would be no further potential for the project to contribute to cumulative noise effects associated with construction activities.

With respect to long-term operational noise from project traffic and stationary noise sources, again there does not appear to be the potential to make a considerable contribution to cumulative noise effects. As noted in subsection 4.1.3, Approach to Cumulative Analysis, inquiries with local land use and utility agencies in the project area did not identify any reasonably foreseeable new projects in the area in the longer term. Also, a review of the applicable local land use plans for the vicinity does not suggest the potential for appreciable development or land use changes in the vicinity of proposed project facilities. Further, as discussed in Impact 4.11.2, the project operation under all alternatives would make extremely minor contributions to the existing ambient noise levels. These contributions would be so small that they would not be cumulatively considerable. With the addition of project operations noise levels would remain similar to existing conditions, and in most project areas outside of the CCWD watershed, ambient noise levels would continue to be dominated by agricultural operations and local traffic noise. The project would not make a cumulatively considerable contribution to the noise environment.

Because, as described above, no other nearby construction projects are anticipated to coincide with project construction activities, no significant cumulative vibration impact would occur.

Mitigation: None required.

4.12 Utilities and Public Service Systems

This section describes the public services and utilities that could be affected by the Los Vaqueros Reservoir Expansion Project and identifies the entities that provide these services (e.g., cities, counties, special districts, water agencies, and power companies) in areas of unincorporated Contra Costa and Alameda Counties. Public and private utilities include local water delivery services, wastewater service, drainage service, electricity and gas, and solid waste disposal. Public services include fire protection, medical services, law enforcement, and schools. The impact analysis focuses on whether the project would result in disruptions in current service levels or necessitate the construction of additional public service or utility facilities.

4.12.1 Affected Environment

Regulatory Setting

As discussed in Section 4.1 – Approach to Analysis, local plans and policies, including those contained in city or county general plans and zoning ordinances, are reviewed in this document to provide background and context for the impact analysis, even though these plans and policies are not applicable to CCWD facilities and projects.

State and Local

California Integrated Waste Management Act (AB 939)

In 1989 the California legislature passed the Integrated Waste Management Act of 1989, known as AB 939. The bill mandates a reduction of waste being disposed: jurisdictions were required to meet diversion goals of 25% by 1995 and 50% by the year 2000 through source reduction and recycling programs. AB 939 also established an integrated framework for program implementation, solid waste planning, and solid waste facility and landfill compliance which requires each county to adopt development program for waste reduction. By Year 2000, the waste diversion rate in unincorporated portions of Contra Costa County was at 46 percent—below the mandated 50 percent reduction. As a consequence, Contra Costa County adopted Ordinance 2004-16, which requires owners of construction or demolition projects that are 5,000 square feet or greater in size to demonstrate that at least 50 percent of the construction and demolition debris generated on the jobsite is reused, recycled, or otherwise diverted (unless a diversion adjustment is granted). Contractors hauling waste to County transfer stations or landfills are typically required to demonstrate reuse, recycling and diversion of construction debris prior to loads being accepted at those facilities. Alameda County has a similar ordinance (Ordinance 2003-63), which applies only to projects on County-owned lands (Alameda County Waste Management Authority, 2003).

Contra Costa County General Plan

The Contra Costa County General Plan contains several goals and policies related to the management, planning, and maintenance of public services and utilities. Specifically, these policies include: assurance of meeting regulatory standards for water delivery, water storage, and emergency water supplies to residents (Policy 7-16); identification of necessary upgrades to fire facilities and equipment in order to reduce fire risk and improve emergency response (Policy 7-65); and reduction of the amount of waste disposed of in landfills (Goal 7-AG) (Contra Costa County, 2005). The goals and policies presented in these plans are listed in Appendix E-2.

East County General Plan – A Portion of the Alameda County General Plan

The East County Area Plan (ECAP) area encompasses 418 square miles of eastern Alameda County and includes the cities of Dublin, Livermore, and Pleasanton, a portion of Hayward, as well as surrounding unincorporated areas. The ECAP includes goals and policies relevant to the management, planning and maintenance of public services and utilities. These goals and policies, listed in Appendix E-1, include: providing prompt and efficient police, fire, and emergency medical service needs to unincorporated areas (Policy 241); ensuring safe and efficient waste disposal (Waste Goal); providing an adequate, reliable and safe water supply (Water Goal); providing efficient and cost-effective sewer facilities and services (Sewer Goal); and facilitating the provision of gas and electric service and facilities (Policy 285) (East County Area Plan, 2002).

Environmental Setting

Utilities

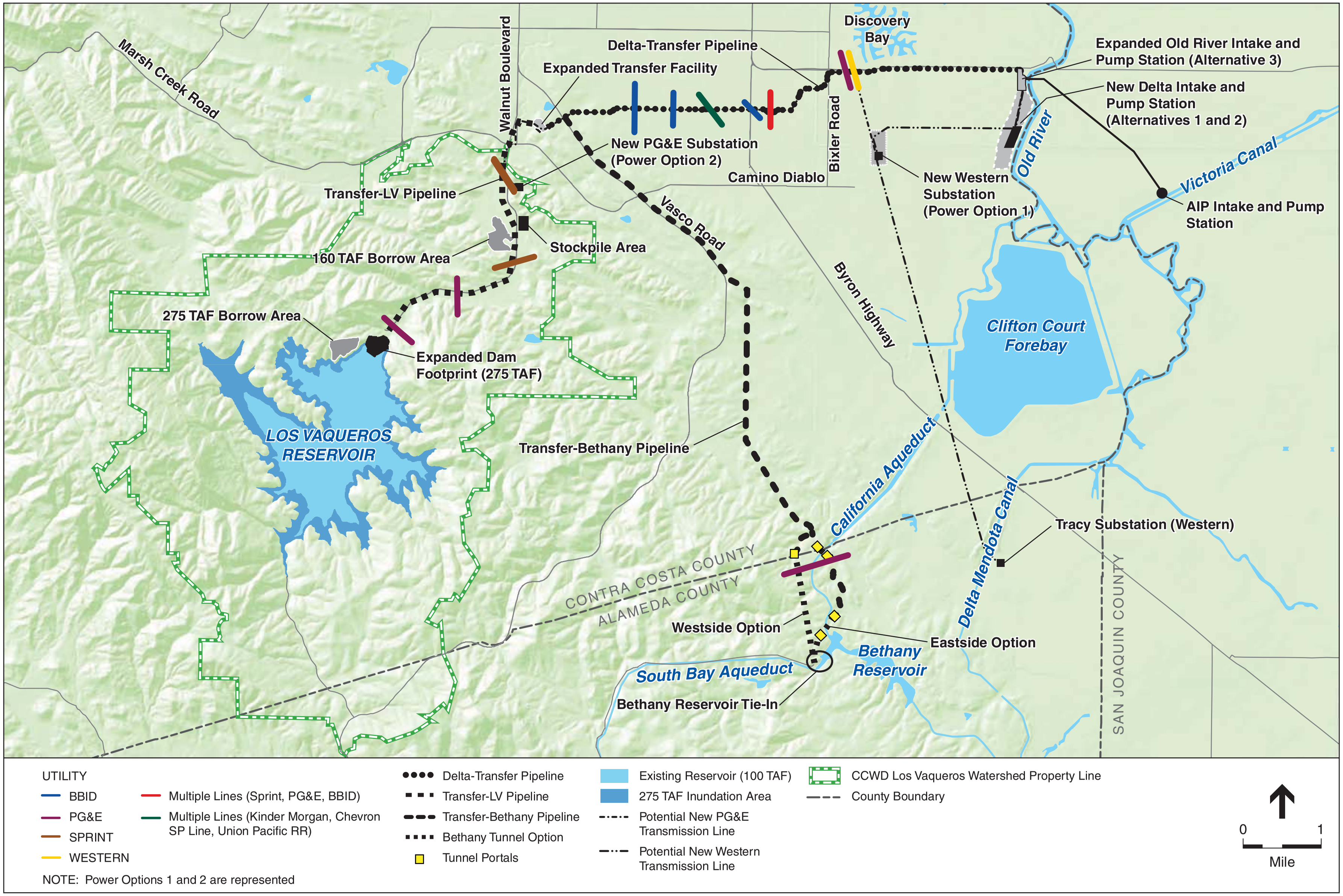
Water Service

The California Aqueduct, which is part of the State Water Project, conveys water from the Harvey O. Banks Pumping Plant to Bethany Reservoir and then south to the San Luis Reservoir and beyond.

Contra Costa Water District (CCWD) provides water service to developed areas within the project area and other portions of eastern and central Contra Costa County. CCWD supplies treated water to Clayton, Clyde, Concord, Pacheco, Port Costa, and parts of Martinez, Pleasant Hill, and Walnut Creek, and treated wholesale water service to Diablo Water District, Brentwood, and Antioch. CCWD also provides untreated water to the cities of Antioch, Pittsburg, and Martinez, Diablo Water District, Golden State Water Company, and industrial and irrigation customers.

Treated water delivery to customers within the project area is the responsibility of cities, water districts, or other public agencies, including the City of Brentwood and the Discovery Bay Community Services District. **Figure 4.12-1** schematically shows potential water pipeline and other utility crossings that could occur due to project construction throughout the project area. Rural residences located throughout the project area in southeastern Contra Costa County obtain their water from local private wells. Irrigation water in the project area is provided by Bethany-Byron Irrigation District (BBID) and the State Water Project. BBID has several canals and water delivery facilities within the area.

Potable water within the Los Vaqueros Reservoir watershed is provided by packaged membrane treatment plants located at the marina, interpretive center, and watershed offices on the north end of the watershed, and at the south-end restrooms and fish-cleaning stations.



SOURCE: USGS, 1993 (base map); and ESA, 2008

Figure 4.12-1
Potential Utility Crossings

Non-potable water is pumped from the reservoir for irrigation of landscaped areas and, in some locations, to operate fire hydrants. There is an existing pipeline located along the alignment of the intake and outflow pipeline that is used to access reservoir water. Landscape areas located near the Marina, Watershed Office, Interpretive Center, Kellogg Picnic Area and the dam are watered by tapping into pipeline blow off release valves. On the western side of the reservoir, water is pumped out of the reservoir to holding tanks for cattle to drink and for oak trees and other mitigation plants to be individually drip irrigated. There are also some springs available for watering trees (Mueller, 2008).

Wastewater Service

Most of the project area is undeveloped and is not served by an integrated wastewater system. Wastewater conveyance and disposal in the project area is provided by the Discovery Bay Community Services District and Byron Sanitary District. The two districts provide wastewater service for areas in the eastern Contra Costa County communities of Discovery Bay and Byron, which are generally north and east of the project area. The current method of wastewater disposal in these areas is either land disposal (land application of treated wastewater onto open space or agricultural lands) or discharge into the San Joaquin–Sacramento Delta after treatment.

In more rural locations, individual septic/leach field systems provide wastewater disposal. These individual systems are privately owned and maintained and are not connected to any larger wastewater treatment facilities.

At the Los Vaqueros Reservoir day-use areas, wastewater from the public restrooms and other facilities are regularly pumped and captured in a holding tank and hauled offsite by a contractor. The contractor that provides service to the Los Vaqueros watershed hauls the wastewater for treatment to EBMUD’s wastewater treatment plant in Oakland, California (Arvizu, 2008).

Drainage / Storm Water Service

Construction and maintenance of the drainage facilities in the project area generally fall under the jurisdiction of Contra Costa County and its Flood Control and Water Conservation District. Drainage service in Alameda County is provided by Zone 7 Water Agency. As the project is almost entirely located in a rural setting, runoff throughout the project area drains primarily through natural drainage swales, ditches, and watercourses.

In Contra Costa County, the Flood Control and Water Conservation District has developed a system of flood zones (entire watersheds) and drainage basins (sub-watersheds) with adopted plans that serve both lands within cities and the unincorporated areas of the county. Some drainage areas in the County are legally “formed” with a legal boundary map, land use map, hydrology map, drainage Area plan, and a fee ordinance while others remain “unformed.” The project area includes both formed and unformed drainage areas. The Kellogg Creek watershed (Basin 109) is identified as a formed drainage area (Contra Costa County, 2003). The Brushy Creek watershed (in both Contra Costa and Alameda Counties) is identified as an unformed drainage area and includes Basins 110 and 45. In urbanized areas east of the reservoir, some of these natural watercourses have been converted to underground storm drains or earthen- and/or concrete-lined ditches, including the lower reaches of Kellogg Creek. See Section 4.5, Local Hydrology, Drainage, and Groundwater, for further discussion of drainage in the project area.

Energy Service

Pacific Gas and Electric Company (PG&E) provides electricity and natural gas service to the project area, including the cities of Brentwood, Byron, and Discovery Bay and the unincorporated areas of Contra Costa and Alameda Counties. PG&E owns or leases 8,255 megawatts (MW) of power-generating capacity. CCWD also obtains electricity from both the Central Valley Project (CVP) and Modesto Irrigation District (MID) at some of its eastern Contra Costa County facilities, including the Old River Pump Station. Hydroelectric power from the CVP is delivered by the Western Area Power Administration (Western). The CVP system of hydroelectric facilities generates power primarily for use by Reclamation in support of pumping requirements as well as providing power to Reclamation contractors, such as CCWD, for use in delivering CVP water. The CVP generates 5.6 million MWh of electricity annually to serve the needs of about 2 million people.

Approximately 7,000 wind turbines are located in the areas south of Los Vaqueros Reservoir. The turbines in this area are operated by PowerWorks, EnXco, Altamont Power, Green Ridge Services, and Seawest Windfarms. There are approximately 320 active wind turbine sites located within the Los Vaqueros Reservoir watershed. The utility lines that connect the turbines to each other and to distribution facilities are buried under the dirt roads that provide access to the turbines. Proposed roads and recreational trails would use these same roads for access (Mueller, 2008).

Utility Infrastructure

Major utility infrastructure within the Los Vaqueros Reservoir watershed includes three buried natural gas pipelines; an overhead PG&E electricity transmission line; two buried PG&E gas lines; and a buried fiber-optic communications line operated by Sprint. To the northeast of the Los Vaqueros Reservoir watershed lie several irrigation lines owned by BBID, two buried petroleum pipelines owned and operated by Chevron/Unocal and Kinder Morgan, a few Sprint fiber-optic cable lines, a PG&E natural gas line, and an overhead electricity line operated by Western.

East of the Los Vaqueros Reservoir watershed lie two underground PG&E gas lines and four existing PG&E transmission lines in the project vicinity. Near the CCWD Transfer Facility is a 230 kV line operated by PG&E, which serves that facility. The line to the east between Vasco Road and Old River contains a transmission corridor with two 500 kV circuits owned and operated by PG&E and a double circuit 230 kV line owned by Western. Western is currently operating this 230 kV line at 69 kV from its Tracy Substation near the Banks Pumping Plant, and serving several loads including CCWD's existing Old River Intake and Pump Station. At present, power for the Old River Intake and Pump Station is supplied by Western and power for the Transfer Facility is supplied by PG&E through their Brentwood Substation. The project includes construction of additional energy infrastructure facilities, as described in Section 3.5.5 Power Supply Infrastructure.

Solid Waste Disposal

Two permitted, large-volume transfer/processing facilities are active in Contra Costa County. The types of materials accepted at these facilities include construction and demolition materials, green materials, agricultural waste, industrial waste, mixed municipal waste, and sludge or biosolids. Non-recyclable industrial waste generated by the project would be transported to Keller Canyon Landfill, located west of the project area on Highway 4. Keller Canyon Landfill serves the eastern and central portions of Contra Costa County and is a Class II facility with a projected life span of 40 years (Contra Costa County, 2005).

Materials recovery facility/transfer stations are used to meet the waste diversion goals mandated by AB 939. These facilities, separately or in combination, provide comprehensive materials recovery operations and efficient waste transfer operations. The station serving the eastern portions of Contra Costa County is the Contra Costa Transfer and Recovery Station (Contra Costa County, 2005).

The 2,170-acre Altamont Sanitary Landfill and the 644-acre Vasco Road Landfill, located in northeastern Alameda County, handle most of the solid waste generated in Alameda County (DWR, 2004).

The Contra Costa County Community Development Department and the Alameda County Waste Management Authority both provide an internet database that includes a list of private organizations that accept building construction or demolition materials such as bricks, concrete, wood and dirt for recycling. There are 19 organizations in the region that accept these construction materials for a fee.

Public Services

Fire Protection/Emergency Medical Services

The East Contra Costa Fire Protection District (ECCFPD) provides fire protection services to much of the project area. The Alameda County Fire Department provides fire protection in the unincorporated eastern portions of the county. Both fire departments maintain mutual-aid agreements with the East Bay Regional Park District, California Department of Forestry, and private industrial companies located within their respective jurisdictions. Both agencies are required to maintain comprehensive and efficient fire and emergency medical response services. As part of this requirement, these agencies must generally demonstrate a five-minute response time for 90 percent of all emergency calls and maintain a fire station within 1.5 miles of all residential and nonresidential developments. Stations within the immediate project area include the following:

- Station No. 57, 3024 First Street, Byron, CA 94514
- Station No. 58, 1535 Discovery Bay Boulevard, Discovery Bay, CA 94514
- Station No. 59, 1801 Bixler Road, Discovery Bay, CA 94514

The ECCFPD operates eight fire stations and contracts an additional one. The engine companies consist of three person crews including one certified Emergency Medical Technician Level 1 (Henderson, 2008). There is also a volunteer San Ramon Valley Fire Protection District Station (Station 40 - Morgan Territory) located along Morgan Territory Road. The Morgan Territory Regional Preserve adjoins CCWD watershed lands boundary to the northwest.

Law Enforcement

The Contra Costa County Sheriff's Department provides law enforcement services to the unincorporated areas of Contra Costa County. The station with responsibility for the project area is the East Contra Costa County's Oakley Delta Station. Likewise, for portions of the project that cross into Alameda County, the Alameda County Sheriff's Department provides law enforcement services. The nearest sheriff's station in Alameda County to the project area is in the San Leandro Eden Township Substation.

Although they do not serve as sworn law enforcement officers, CCWD employees routinely tour District facilities while conducting their regular duties. There is also a Marina Manager residing near the existing marina, to provide a 24-hour presence at that facility.

Schools and Recreation

No school facilities are located within 0.5 miles of any project facilities or construction sites, and therefore are not discussed further. Park and recreation facilities are discussed in Section 4.15, Recreation.

4.12.2 Environmental Consequences

Methodology

Analysis of the potential for construction activities to disrupt utilities was prepared through review of planning documents and websites, and by telephone communications with representatives of area agencies in order to identify and describe existing utilities (water, wastewater, drainage, energy, solid waste disposal) and public service (fire protection/ emergency medical services and law enforcement) facilities and systems. The identified facilities and services were then compared with proposed construction activities to assess the potential for service disruptions. Analysis of the project's potential to increase solid waste generation and meet state targets related to solid waste was conducted by identifying the excess materials that would be generated by the project, estimating the quantity of such materials that would be re-used, recycled or otherwise diverted from landfills, and assessing the potential for the project to exceed state targets for construction debris.

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant impact to utilities and public service systems if it would do any of the following:

- Disrupt utility or public services (e.g., interfere with emergency services or evacuation plans) such that a public health hazard could be created or an extended service disruption could result;
- Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services: fire protection, police protection, schools, or other public facilities;
- Require or result in the construction of expanded or new water or wastewater treatment facilities or stormwater drainage facilities, the construction of which could cause significant environmental effects; (part of the project description; addressed throughout EIS/EIR)
- Have insufficient water supplies available to serve the project from existing entitlements and resources, thereby necessitating new or expanded entitlements;
- Generate waste materials that would exceed the permitted capacity of local landfills, or not comply with state regulations related to solid waste;
- Require the construction of additional energy infrastructure facilities that would have significant environmental effects. (part of the project description; addressed throughout EIS/EIR)

The proposed reservoir expansion and other project components involve construction of expanded and new water facilities and infrastructure, as described in Section 3.4 Action Alternatives. Because water-related facilities form the major components of the project, each technical section and related impact discussion evaluates potential impacts associated with expansion of the reservoir, new pipelines and facility locations. Potential project impacts related to water supplies are addressed in Section 4.2, Delta Hydrology and Water Quality. Project impacts associated with drainage facilities are addressed in Section 4.5, Local Hydrology, Drainage, and Groundwater. For these reasons, no further discussion about the need for additional water treatment facilities or infrastructure, or their associated impacts, are included in this section.

The project also includes construction of additional energy infrastructure facilities, as described in Section 3.5.5 Power Supply Infrastructure. Because power supply is a component of the project, each technical section and related impact discussion evaluates Power Options 1 and 2 for impacts associated with new transmission lines and substation locations. For this reason, no further discussion about the need for additional energy infrastructure facilities and associated impacts is included in this section.

Impact Summary

Table 4.12-1 provides a summary of the impact analysis for issues related to utilities and public service systems based on actions outlined in Chapter 3.

TABLE 4.12-1
SUMMARY OF IMPACTS – UTILITIES AND PUBLIC SERVICE SYSTEMS

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.12.1: Construction or operation of project alternatives could temporarily disrupt utilities and public service systems such that a public health hazard could be created or an extended service disruption could result.	LSM	LSM	LSM	LSM
4.12.2: Project alternatives would not require or result in construction of new or expanded utility infrastructure or public service facilities that would result in substantial adverse physical impacts.	LS	LS	LS	LS
4.12.3: Construction of the project alternatives could increase solid waste generation such that the capacity of local landfills would be exceeded or the project would not comply with state regulations related to solid waste.	LSM	LSM	LSM	LSM
4.12.4: Construction of the project alternatives could make a cumulatively considerable contribution to cumulative effects on public services and utilities, or local landfill capacity.	LSM	LSM	LSM	LSM

NOTE:
SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new project facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Implementation of this alternative would neither temporarily nor permanently affect the utilities and public services evaluated in this section.

Impacts 4.12.1: Construction or operation of the project alternatives could temporarily disrupt utilities and public service systems such that a public health hazard could be created or an extended service disruption could result. (Less than Significant with Mitigation)

Overview – All Alternatives

Construction of project facilities has the potential to cause short-term disruptions in utility and public services during the approximately 3-year project construction period. For utilities, construction activities have the potential to directly interrupt water, wastewater, and drainage, electrical or gas lines during installation of new pipelines, auguring for power poles or similar activities. This could include planned shut off of electrical service in a limited area and for a limited duration while crossing existing utilities lines; alternatively, disruption of utilities could be an unintentional result of encountering unsurveyed drainage or other utility lines during pipeline trenching. Indirect effects, such as availability of potable water and wastewater services in the watershed while the reservoir area is under construction, are also addressed in this section. Extended disruption of electricity, gas or other utilities could result in public health hazards, such as loss of power during an extended heat wave.

As for public services, major construction projects such as the Los Vaqueros Reservoir expansion could result in short-term, localized access issues such as blocked driveway at residences needing fire protection, emergency medical or law enforcement services. There is also the potential to increase emergency response times for fire, emergency medical and law enforcement equipment and personnel due to increased traffic for construction material deliveries and construction workers. Section 4.9, Transportation and Circulation, addresses the potential of the proposed project to temporarily affect emergency response times and access during construction. Section 4.13 analyses impacts on emergency response/evacuation plans and wildland fire risk.

Water Supply Disruption. Under Alternatives 1, 2 and 3, the reservoir would be drained to allow for the dam modification construction, would remain empty for the three-year project construction period and would take an additional year to fill (see Section 3.5.2 Draining the Reservoir for Construction) The time needed to refill the reservoir depends on hydrologic conditions and Delta water quality during the refilling. During this period, CCWD would be able to meet its water quality goals in all but short portions of the driest years through use of the AIP facility on Victoria Canal and the intertie with EBMUD's Mokelumne Aqueduct. Under current reservoir operations, most blending for water quality is done in the fall when the quality at the Old River Intake declines. However, water quality is higher at the AIP during fall allowing water quality goals to be met with direct deliveries in most years. Additionally, under CCWD's agreement with EBMUD, 3,200 acre-feet per year of CCWD's CVP water can be diverted through the Freeport Regional Water Project facilities in the northern Delta where water quality is significantly better than at the Old River Intake. CCWD would coordinate with EBMUD to take this water when it would provide the most water quality benefit to CCWD customers. The intertie with EBMUD could also provide water in an emergency.

To further minimize the potential for water supply disruption during project construction, CCWD would provide for supplemental water supply by constructing and making operational the new Delta Intake and Pump Station (Alternatives 1 and 2) or upgrades to the Old River Intake and Pump Station (Alternative 3) early in the construction period. This additional water diversion capacity would be available in the event of an emergency or extended drought.

Under Alternative 4, a limited dam raise necessary to expand the reservoir to 160 TAF could be achieved by constructing on the downstream slope of the existing dam only, allowing the reservoir to remain in operation through the majority of construction. A drawdown of up to 60 TAF would occur during a 2-year rather than a 4-year construction period.

Also, as indicated above, CCWD would make arrangements with the East Bay Municipal Utility District (EBMUD) to secure an additional temporary supplemental supply of water during the construction period and make use of the existing CCWD-EBMUD intertie to make emergency water deliveries into the CCWD system if needed. The intertie connects EBMUD's Mokelumne Aqueduct with CCWD's Contra Costa Canal. Like other inter-agency interties, the EBMUD-CCWD intertie was built to provide flexibility and reliability for Bay Area water users. With these provisions, water supply services would not be disrupted during the temporary project construction and reservoir re-filling period.

Alternative 1

Los Vaqueros Reservoir Expansion and Recreation Facilities

Utilities. Expansion of the Los Vaqueros Reservoir would not be expected to disrupt utilities because there are relatively few utility lines in place, and because the reservoir area would be closed to visitors during construction. During construction, potable water systems (packaged membrane treatment plants, described under Water Services) that supply water within the Los Vaqueros watershed would be dismantled in preparation for relocation to new sites. Drinking water would be delivered to the site for CCWD staff and construction workers using bottled water or other temporary systems. Non-potable water for landscape irrigation, care of oak trees and other plants and livestock ponds would be obtained by tapping water stored in pipelines on the east side of the reservoir, and through use of tanker trucks for water delivery. Existing wastewater systems would also be closed during construction, and vaults removed from areas to be inundated. Temporary portable systems (port-o-potties) would be used during construction. In summary, only temporary utility systems would be operated during construction, including construction of replacement and new recreation facilities, and there would be no customers to be disrupted within the reservoir area.

Energy. Six natural gas lines, including one near the base of the dam, traverse the existing reservoir; however, these facilities are no longer operational and are partially submerged due to construction of existing reservoir facilities. An existing PG&E electrical transmission line traverses the eastern shoreline, but would not be affected by the increased water level of the reservoir, the new dam impoundment, or the relocated recreation facilities. Therefore, these lines would not be affected by the proposed expansion.

Two active wind turbine sites located at the southeastern shore of the Los Vaqueros Reservoir would be inundated under Alternative 1. CCWD would work with the owners of the wind-generation facilities to relocate the generation capacity within the existing wind generation easement area or to compensate the owner as required under existing operating agreements.

Public Services. During the initial year for draw down, the 3-year construction period, and another year for refilling the reservoir, the watershed would be closed to visitors; only limited numbers of CCWD staff and construction workers would be allowed on CCWD property. Some CCWD staff would continue to manage watershed lands outside of construction areas; however the area gates would be locked to prevent visitors. Until construction of replacement and new recreational facilities is completed, including a new marina complex, access to watershed recreation areas would remain closed to the public. As such, there would be less need than usual for fire, emergency medical and law enforcement services and provision of public safety services would not be disrupted. More information about maintaining emergency access during construction is provided in Section 4.9, Transportation and Circulation. More information about reducing the risk of wildfires is provided in Section 4.13 Hazardous Materials/Public Health.

New Delta Intake Facility

Utilities. No existing utilities are expected to be disrupted by construction activities associated with the new Delta Intake and Pump Station because there are no water, wastewater, drainage or energy pipelines located within the construction zone of the proposed facility. There is a 69 kV transmission line that serves the Old River Intake and Pump Station, passes through the siting zone, and that will be upgraded to serve the proposed Intake as a component of the proposed project. As such, the design, construction and coordination of these new overhead lines will be implemented in a manner to avoid power disruptions to the Old River Facility.

Public Services. As for public service issues, construction of a new intake facility would occur in an agricultural area of the county with few residents or services to be disrupted. During and after construction, the site will be fenced and gated, and access limited to CCWD staff and construction workers. No disruption of utilities or public services would result from construction of the new Delta Intake Facility.

Conveyance Facilities

Utilities. Construction of the Delta-Transfer Pipeline, expanded Transfer Facility, Transfer-LV Pipeline and Transfer-Bethany Pipeline could result in disruptions to the underground and/or overhead utilities that are shown on Figure 4.12-1. There is also the possibility during construction of disrupting un-surveyed utilities.

As shown in Figure 4.12-1, the Delta-Transfer Pipeline would cross as many as six BBID irrigation lines; two petroleum pipelines (Chevron and Kinder Morgan); a Sprint fiber-optic cable line; a Western transmission overhead line; and two PG&E 500 kV overhead transmission lines. The Delta-Transfer pipeline would also cross the Union Pacific Railroad tracks. As described in Section 3.5.2, Pipeline Construction, the bore-and-jack method would be used to pass under the railroad crossing.

The Transfer-LV Pipeline alignment would cross two PG&E natural gas pipelines and two Sprint fiber-optic cables.

The Transfer-Bethany pipeline alignment would cross one Western electric transmission line and two 36-inch PG&E natural gas lines. There are no known utility lines located in the area planned for the Westside Option pipeline tunnel. The pipeline's Eastside Option would tunnel under the California Aqueduct.

Public Services. As for public service issues, construction of a new intake facility would occur in an agricultural area of the county with few residents or services to be disrupted. More information about emergency medical services, including discussion of access during construction, is addressed in Section 4.9, Transportation and Circulation.

Power Supply

Utilities. Under both Power Options 1 and 2, addition of new transmission lines on existing, replacement, or new power poles would occur in existing utility easements. As such, auguring for power poles and other construction activities has some potential to disrupt existing utilities, which are the same utilities as in Delta-Transfer and Transfer-LV Pipelines. There is also a slight potential to impact existing or abandoned septic systems; however, this is not likely due to the relatively few houses along the power supply alignment. As for disruptions of utilities during construction of either a Western Substation under Power Option 1 or a PG&E substation under Power Option 2, this is not likely because there are no known underground utilities in potential substation siting zones.

Public Services. Construction of new power supply facilities would occur in rural areas of the Contra Costa County with relatively few residents or services to be disrupted. Furthermore, construction of new electrical lines involves placing power poles and stretching lines in a manner that would not limit access to nearby properties. Both of the two substation siting zones are in areas with limited access and limited services to be interrupted.

Summary

In summary, there is a relatively low potential for any one project component to disrupt existing utility lines or public services; however, when considered in the context of multiple project components under concurrent construction for an approximately 3-year period, the potential for disruption is increased considerably. There is also the possibility during construction of disrupting un-surveyed utilities. For this reason, Under Alternative 1 there is the potential for short-term disruption of utilities and public services; related impacts would be significant.

Alternative 2

Under Alternative 2, impacts from disruption of utilities and public services would be the same as those for Alternative 1 since the facilities to be constructed would be the same. Under Alternative 2, impacts related to short term disruption of utility or public services would be significant.

Alternative 3

Alternative 3 would exclude construction of a new Delta Intake or a Transfer-Bethany pipeline, and facility expansion at the Old River Intake would occur within its existing site, so there would be less potential for disruption of utilities and public services when compared with Alternative 1. However, there would be some potential for short-term disruption of utilities and public services resulting in a significant impact under Alternative 3.

Alternative 4

Under Alternative 4, impacts from disruption of utilities and public services would be substantially less than that generated by construction of Alternative 1 because Alternative 4 would not include facilities outside CCWD watershed property lines. Figure 4.12-1 shows the BBID, PG&E, Sprint, Western and other utility crossings that would be avoided.. Alternative 4 would include a dam raise for a 160 TAF reservoir expansion that would be smaller and involve less construction activity than the dam raise required under Alternative 1 for the 275 TAF Reservoir, thereby avoiding inundation of 2 wind turbines. Further, there would be no potential for blocked driveways and other interferences with emergency personnel during construction. However, there would be some potential for short-term disruption of utilities and public services and an increased potential for wildfires resulting in a potentially significant impact under Alternative 4.

Mitigation Measures

Implementation of mitigation Transportation and Circulation Measure 4.9.2: This mitigation involves requirements to reduce the potential for impeding emergency access.

Implementation of mitigation Hazards Materials and Public Safety Measure 4.13.3: This mitigation involves required activities to reduce the potential risk of wildfires.

Measure 4.12.1a: Prior to construction of the project facilities and once pipeline alignments have been finalized, a detailed survey identifying utilities along the proposed alignments will be conducted. The survey results and the following measures will be incorporated into final design plans and specifications to avoid or minimize potential conflicts with utilities:

a. Utility excavation and encroachment permits will be acquired from the appropriate agencies, including the Public Works Departments of Contra Costa and Alameda Counties. CCWD will incorporate permit conditions in contract specifications that are designed to ensure no disruptions in service occur during construction. Contractors will be required to comply with permit conditions contained in contract specifications.

b. CCWD shall ensure that Underground Service Alert is notified at least 14 days prior to initiation of construction activities of the underground portions of each transmission lines and utility structures. Underground Service Alert verifies the location of all existing underground utilities and alerts the other utilities to mark their facilities in the area of anticipated construction activities.

c. A detailed engineering and construction plan will be prepared as part of the design plans and specifications. This plan will include procedures for the excavation, support, and fill of areas around utility cables and pipes to ensure that utility cables are not damaged. All affected utility service providers will be notified of the construction plans and schedule, and arrangements will be made with these entities regarding the protection, relocation, or temporary disconnection of services.

d. In shared utility easement areas where a project pipeline might parallel wastewater mains, the engineering and construction plans will include trench-wall support measures to guard against potential trench wall failure and the resulting loss of structural support for the wastewater main.

e. The California Department of Health Services standards will be observed; these standards require: (1) a 10-foot horizontal separation between parallel sewer and water mains (gravity or force mains); (2) a 1-foot vertical separation between perpendicular water and sewer line crossings; and (3) encasing sewer mains in protective sleeves where a new water line crosses under or over an existing wastewater main. If the separation requirements cannot be maintained, a variance will be obtained from the Department of Health Services through the provision of sewer encasement or other means the department deems suitable.

f. Final construction plans and specifications will be coordinated with affected utilities including PG&E, Western, and the California Department of Health Services Sanitary Engineering Branch.

g. Emergency response plans and protocols, as required under construction permit conditions, shall be incorporated into project construction specifications.

Measure 4.12.1b: CCWD shall phase construction to minimize the potential for water supply emergencies and complete formal arrangements with EBMUD for water supply backup prior to draining the Los Vaqueros Reservoir and initiating project construction.

Impact Significance After Mitigation: Less than significant.

Impact 4.12.2: The project alternatives would not require or result in construction of new or expanded utility infrastructure or public service facilities that would result in substantial adverse physical impacts. (Less Than Significant Impact)

Overview – All Alternatives

For a finding of adverse significance related to Impact 4.12.2 to be made, two conditions must be met simultaneously: 1) the proposed project must require or result in construction of new or expanded utility infrastructure or public service facilities; and 2) those required facilities must result in substantial adverse physical impacts. Additional infrastructure, such as a new wastewater treatment facility or fire station, would be required in the event the project would result in an adverse effect on performance objectives during construction or operations such that additional services and new facilities would be required.

As indicated in the subsection 4.12.2 Significance Criteria discussion, above, the proposed reservoir expansion and related project components involve construction of expanded and new water facilities and infrastructure. As described in Section 3.4 Action Alternatives, these water-related and power supply facilities form the major components of the project; they do not require or result in the need for additional utility infrastructure or public service facilities that are not already integral parts of the proposed project. The potential for the utility and public service components of the project to cause adverse physical impacts is addressed in each technical section, where each impact discussion evaluates potential impacts associated with expansion of the reservoir, new pipelines and other facilities.

Also, as discussed in Section 4.20 Growth Inducement, the project does not involve development of new residential, commercial or industrial land uses, therefore none of the alternatives would directly or indirectly result in the kind of population growth or non-residential development that requires additional utilities and public services. However, in order to provide a comprehensive assessment of potential impacts in this EIS/EIR, utility and public services (with the exception of water and power) are further assessed by alternative and by service type.

Alternative 1

Wastewater

Reservoir Expansion/ Dam Modification and Recreation Facilities. At present in Los Vaqueros Reservoir day-use areas, wastewater from the public restrooms and other facilities are regularly pumped and captured in a holding tank and hauled offsite by a licensed contractor. During construction, the reservoir would be closed to recreationalists and other visitors, and area use limited to CCWD staff and construction workers. Upon re-opening of the reservoir, new recreation facilities including a new interpretive center and marina complex could result in a substantial increase in visitors. However, the Los Vaqueros Reservoir's utility and recreational components are widely dispersed throughout the watershed such that there would not be a need to construct an on-site wastewater treatment plant system. After construction, CCWD would resume the existing system of wastewater treatment via off-site hauling.

New Delta Intake and Pump Station. The proposed intake facility would not have any staff assigned to this location and there would be no wastewater facilities provided at this location.

Transfer Facility Expansion. The existing transfer facility does not have any staff assigned to it and there are no wastewater facilities provided at this location. This situation would not change after the Expanded Transfer Facility is operational.

Drainage

As the project is almost completely located in a rural setting, much of the drainage system serving the project area consists of natural drainage swales, ditches, and watercourses. None of the project facilities would be constructed in areas with a developed storm sewer system. This situation would not change with construction of the proposed project. More information about drainage facilities, including more discussion of impacts, is addressed in Section 4.5, Local Hydrology, Drainage, and Groundwater.

Fire Protection/ Emergency Medical Services.

Reservoir Expansion/ Dam Modification and Recreation Facilities. Although recreational opportunities, including a new marina complex and more boats, will be enhanced, there will not be such a substantial increase in the annual number of visitors to the reservoir that additional fire engines, ambulances or a new fire station would be needed. More information about emergency medical services, including more discussion of impacts, is addressed in Section 4.9, Transportation and Circulation.

New Delta Intake and Pump Station. Like the existing Old River Intake and Pump Station, the new intake would require minimal fire monitoring and protection. Given the size of the new intake, dedicated fire personnel would not be required to provide fire protection for the new intake. Thus, the project would not increase long-term demand for public services or utilities, including fire and police protection, additional schools, parks, wastewater and other public facilities, that would necessitate the construction of new or altered government service facilities.

Transfer Facility Expansion. The existing transfer facility does not have any staff assigned to it and there are no fire-prone facilities provided at this location. This situation would not change after the Expanded Transfer Facility is operational.

Law Enforcement

Reservoir Expansion, Dam Modification and Recreation Facilities. Although recreational opportunities, including a new marina complex and more boats, will be enhanced, there will not be such a substantial increase in the annual number of visitors to the reservoir that additional patrol vehicles or a police substation would be needed. The Los Vaqueros reservoir is available for day use only, its gates are locked each evening, and there is an on-site Marina manager that provides security (Mueller, 2008).

New Delta Intake and Pump Station. Like other District facilities, the new intake would be gated to provide site security, and it is not anticipated that dedicated security or police protection services would be required.

Transfer Facility Expansion. The existing transfer facility is gated, does not have any staff assigned to it and is not the type of facility that attracts law enforcement issues. This situation is not anticipated to change after the Expanded Transfer Facility is operational.

Power Supply Facilities. Like existing power supply substations, the new Western or PG&E substation would be gated to provide site security; it is not anticipated that dedicated security or police protection services would be required. Overhead transmission lines would not be fenced.

In summary, Alternative 1 would not require construction of new or expanded utility infrastructure or public service facilities. Therefore, there is no potential for project facilities that would result in substantial adverse physical impacts.

Alternative 2

Under Alternative 2, impacts related to utilities and public services would be the same as those for Alternative 1 since the project facilities to be constructed would be the same. Under Alternative 2, there is no potential for project facilities that would result in substantial adverse physical impacts.

Alternative 3

Like Alternative 1, Alternative 3 would not require construction of new or expanded utility infrastructure or public service facilities. Therefore, there is no potential for project facilities that would result in substantial adverse physical impacts.

Alternative 4

Like Alternative 1, Alternative 4 would not require construction of new or expanded utility infrastructure or public service facilities. Therefore, there is no potential for project facilities that would result in substantial adverse physical impacts.

Mitigation: None required.

Impact 4.12.3: Construction of the project alternatives could increase solid waste generation such that the capacity of local landfills would be exceeded or the project would not comply with state regulations related to solid waste. (Less than Significant)

Overview – All Alternatives

The Los Vaqueros Reservoir Expansion with construction of major facilities and their associated infrastructure have the potential to increase solid waste generation during the approximately 3-year project construction period. However, there would be relatively little trash hauled to landfills because there would no demolition of buildings and due to the high amount of clean excavation materials that would be re-used for backfill. There would also be re-cycling of wood, metal and other materials, diversion of tunnel spoils to designated areas or as road base, stockpiling of clean fill in a manner that will allow its subsequent re-use; and use of landfills as a final choice for solid waste disposal after other options have been exhausted. Contractors hauling waste to County transfer stations or landfills would be required to demonstrate reuse, recycling and diversion of construction debris prior to loads being accepted at those facilities.

Alternative 1

Los Vaqueros Reservoir Expansion and Dam Modification

Raising the Los Vaqueros Reservoir dam and construction of Appurtenant Facilities (i.e. – Spillway, Inlet-Outlet works and Hypolimnetic Oxygenation System) for the enlarged reservoir would generate substantial amounts of excess materials, especially during construction of the dam impoundment and also, to a lesser extent, during the relocation of existing recreational facilities. Under Alternative 1 approximately 1,000,000 cubic yards of wet alluvium and spoils (i.e., earth and rock excavated or dredged) would be excavated immediately upstream of the existing dam. No excavated materials would require off site disposal as excess earthen materials would be disposed within the reservoir inundation zone. Although not expected based on experience from construction of the original dam, any spoils or waste not suitable for the reservoir inundation zone would be hauled to a suitable location for recycling or disposal, depending on the type and volume of material to be disposed. Types of solid waste that would be removed include a minor amount of construction debris, including miscellaneous wood scraps, metals, and packaging materials for equipment would likely be hauled off-site to materials recycling facilities.

New Delta Intake Facility

Excess excavation materials from the transfer facility expansion or other construction would be used at the 20-acre new Delta Intake Facility. With its peat soils and need to expand the levee around the site, construction of the new Delta Intake Facility is unlikely to generate excess soil materials.

Conveyance Facilities

All Pipelines - Excavation and Backfill. An estimated 25 percent of the excavated soil would be hauled away from the work sites for disposal or reuse elsewhere. The remaining 75 percent would be stockpiled (sidecast) near the construction work zones for later use as backfill material. Trench dimensions of 48 feet wide by 27 feet deep (from the ranges of widths and depths presented in Chapter 3, Project Description) have been conservatively assumed for this analysis, and pipe diameters were also used to calculate the amount of hauled material, based on the volume displaced by the pipe itself. Pipe diameters are as follows:

- Delta-Transfer Pipeline (Alternatives 1 through 3) would be up to 96 inches in diameter.
- Transfer-LV Pipeline (Alternatives 1 through 3) would be up to 132 inches in diameter.
- Transfer-Bethany Pipeline (Alternatives 1 or 2) would be up to 132 inches in diameter.

Excess fill dirt not used to backfill trenches would be stored and reused as clean fill for other project components such as construction of levee improvements at the new Delta Intake Facility; due to the value of clean fill and the availability of space to store the fill until it is used, fill is unlikely to be hauled to one of 19 regional construction materials recycling facility.

Transfer Facility. Construction of the new 8 million-gallon (MG) tank during expansion of the Transfer Facility would generate approximately 270,000 cubic yards of excess fill dirt. This excess fill dirt would be stored and reused as backfill for other project components or sent to one of 19 regional construction materials recycling facilities.

Transfer-Bethany Pipeline - Excess Tunnel Material. Excavation of a tunnel under the Westside Option as part of the Transfer-Bethany Pipeline would create about 112,000 cubic yards of waste rock and tunnel spoils. The Eastside pipeline option would generate about 15,000 cubic yards of waste rock and tunnel spoils. Tunnel spoils would be hauled from the tunnel excavation for temporary onsite storage and/or subsequent final disposal. The larger waste rock would be disposed at either a 22-acre area near the terminus of Byron Hot Springs Road or along project access roads where it would be used as a roadway sub-base or surface. The Vasco Road Landfill could potentially serve as a disposal site for construction spoils near this project area, although landfill disposal is not anticipated for earthen materials.

Power Supply

Re-use of existing power poles, addition of new power poles and re-stringing of transmission lines would generate relatively small amounts of excess fill. However, during construction of a new substation, there is the potential for used power poles and other utility debris to be generated. Once these facilities are constructed, operation of power supply facilities is anticipated to generate solid waste in quantities that are about the same as that generated under existing conditions.

Recreation Facilities

Relocation and re-construction of recreational facilities would generate relatively small amounts of excess fill. However, during construction of the new Marina Complex, Interpretive Center and other recreational facilities (Fishing Piers, Picnic Areas, Restrooms and Parking), there is the potential for construction debris to be generated If excess materials were not re-used, re-cycled or diverted from local landfills, non-reusable solid waste generated during construction would be taken to the nearest materials recovery facility/transfer station and transferred to Keller Canyon Landfill, a Class II facility with a projected lifespan of 40 years and sufficient permitted capacity to accommodate the anticipated solid waste disposal needs of the project.

Post Construction Operations

Once constructed, operation of recreation facilities at the Reservoir would continue to produce solid waste in a quantity that is approximately equivalent to that generated under existing operations; therefore, project operations would not substantially increase the amount of waste to be collected, transported, and disposed of at a regional landfill.

In summary, Alternative 1 would result in potentially significant impacts related to solid waste generation due to the scale of the project and amount of excess materials to be generated by dam modifications, pipeline and tunnel excavation and building of new utility and recreation structures.

Alternative 2

The discussion provided under Alternative 1 would apply to Alternative 2 because the facilities to be constructed under both alternatives would be the same. Under Alternative 2, solid waste generation would result in potentially significant impacts.

Alternative 3

Under Alternative 3, solid waste generation would be reduced as compared to Alternative 1 because there would be no construction of a new Delta Intake and Pump Station or Transfer-Bethany Pipeline. Without the Transfer-Bethany Pipeline construction, there would be no need for hauling and disbursing tunnel spoils for either the pipeline's Westside or Eastside Options. The Old River Intake and Pump Station would be expanded, however this expansions would be limited to on-site improvements. However, there would be the potential under Alternative 3 for solid waste generation to result in potentially significant impacts due to the amount of excess materials to be generated by dam modifications, pipeline excavation and building of new utility and recreation structures.

Alternative 4

All facilities included in Alternative 4 are analyzed under Alternative 1, above. There would be no improvements constructed at the Expanded Transfer Facility or new Delta Intake and Pump

Station under this alternative resulting in less solid waste generation than what has been determined under Alternative 1. However, there would be the potential under Alternative 4 for solid waste generation to result in potentially significant impacts due to the scale of the reservoir expansion and dam modifications.

Mitigation Measures

Measure 4.12.3: CCWD will incorporate into the contract plans and specifications the requirement that the contractor implement solid waste reduction and debris recovery practices as developed by CCWD. The solid waste reduction / debris recovery specifications will include the following items.

a. describe the planned management methods for all types of construction and demolition debris (e.g., reuse, recycling, or disposal), and indicate the types of debris expected to be generated by the project (e.g., wood, drywall, concrete, cardboard, and metal)

b. name all service providers and/or facilities to be used for debris management (or indicate that the debris, such as dirt, will be reused onsite)

c. demonstrate that at least 50 percent (by weight) of jobsite debris is diverted from disposal in a landfill by providing receipts and/or gate-tags from all facilities and service providers used to recycle, reuse, or dispose of jobsite debris.

Project waste generation would be avoided or minimized in a number of ways, which would be outlined in the project's solid waste reduction / debris recovery plan, and incorporated into project plans and specifications for implementation by contractors selected to complete project construction. To reduce solid waste generation, a series of practices would be developed, as follows:

Re-use of excavation backfill. Fill materials excavated during project grading and drilling would be reused as fill materials during project construction, while soils excavated during pipeline construction would be used to backfill trenches after pipeline installation.

Recycling of materials. Some construction materials, including some wood scraps, metals, and packaging materials could be recycled for later resale e.g. – wood scraps sold as landscape mulch.

Re-Use of excess fill. Clean fill could be accepted for use at other construction sites, or stored at existing sand and gravel facilities until (re)used as clean fill.

Roadway sub-base or surface material. Larger waste rock from excavation of tunnels would be placed along project access roads as a roadway sub-base or surface.

Divert waste to non-landfill locations. Additional amounts of the larger waste rock could be disposed of at a 22-acre area near the terminus of Byron Hot Springs Road.

Impact Significance after Mitigation: Less than Significant.

Impact 4.12.4: Construction of the project alternatives could make a cumulatively considerable contribution to cumulative effects on public services and utilities, or local landfill capacity. (Less than Significant with Mitigation)

Disruption of Utilities and Services

As indicated in the discussion related to Impact 4.12.1, construction of major facilities and their associated infrastructure have the potential to cause short-term disruptions in utility and public services during the approximately 3-year project construction period including limitations on reservoir use for approximately 5 years. This may be a planned shut off of electrical service in a limited area and for a limited duration while crossing existing utilities lines; alternatively, disruption of utilities could be unintentional. There is also some potential for extended disruption of electricity, gas or other utilities that could result in public health hazards, such as loss of power during an extended heat wave. If the proposed project were to be built concurrently with other area projects, there would be an increased potential for cumulative impacts. However, with implementation of Mitigation Measure 4.12-1a, impacts associated with disruption of utilities and public services are not anticipated being cumulatively considerable.

Additional Utilities and Services

As discussed under Impact 4.12.2, the project does not involve development of new residential, commercial or industrial land uses, and none of the alternatives would directly or indirectly result in the kind of population growth or non-residential development that requires additional utilities and public services. Assessment of all the proposed project facilities and alternatives indicated that the project would not require construction of new or expanded utility infrastructure or public service facilities. Furthermore, there is no potential for project facilities that would result in substantial adverse physical impacts; therefore the project would not contribute to significant cumulative impacts.

Solid Waste Generation

The Los Vaqueros Reservoir Expansion with construction of major facilities and their associated infrastructure have the potential to significantly increase solid waste generation during the approximately 3-year project construction period. State regulations related to solid waste require construction and demolition debris generated on a jobsite to be reused, recycled, or otherwise diverted. Contractors hauling waste to County transfer stations or landfills would be required to demonstrate reuse, recycling and diversion of construction debris prior to loads being accepted at those facilities. The project would incorporate activities and other requirements in order to minimize environmental impacts of solid waste generation, transport and disposal and meet requirements of AB 939. In the same way, other construction projects would be required to meet waste reduction standards, which would lower the potential for creating cumulative impacts related to solid waste. With implementation of Mitigation Measure 4.12-3, the proposed project impacts related to solid waste generation are not anticipated to be cumulatively considerable.

Mitigation Measures

Implementation of Mitigation Measures 4.12-1 and 4.12-3, including implementation of a solid waste reduction / debris recovery plan as required under AB 939, will reduce potential cumulative impacts to less-than-significant levels.

Impact Significance after Mitigation: Less than significant with mitigation.

4.13 Hazardous Materials / Public Health

This section discusses the hazardous materials and other hazard issues associated with project construction and project operations. The issues evaluated include the potential for toxic substances in soil and groundwater resulting from past use, spills, or leaks of hazardous materials into the ground in proposed construction areas as well as the potential of the project to generate and discharge hazardous materials during construction and operation.

This section also discusses potential impairment of emergency response or evacuation plans and the risk of wildland fires. In addition, specific to the proposed power supply facilities, this section addresses the issue of electric and magnetic fields (EMF) that could be associated with additional electrical transmission lines and substations proposed under some project alternatives.

4.13.1 Affected Environment

Regulatory Setting

Federal and State

Hazardous Materials and Waste Handling

The federal Resource Conservation and Recovery Act of 1976 (RCRA) established a “cradle-to-grave” regulatory program governing the generation, transportation, treatment, storage, and disposal of hazardous waste. Under RCRA, individual states may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as federal RCRA requirements. In California, the Department of Toxic Substances Control (DTSC) regulates the generation, transportation, treatment, storage, and disposal of hazardous material waste. The hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; dictate the management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills.

Throughout both Contra Costa County and Alameda County, a hazardous materials management plan must be prepared and submitted to the County by businesses that use or store certain quantities of hazardous materials.

Hazardous Materials Transportation

The U.S. Department of Transportation regulates hazardous materials transportation on all interstate roads. Within California, the state agencies with primary responsibility for enforcing federal and state regulations and for responding to transportation emergencies are the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). Together, federal and state agencies determine driver-training requirements, load-labeling procedures, and container specifications. Although special requirements apply to transporting hazardous materials, requirements for transporting hazardous waste are more stringent, and hazardous waste haulers must be licensed to transport hazardous waste on public roads.

Worker Safety

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the work place. The California Division of Occupational Safety and Health (Cal-OSHA) and the federal Occupational Safety and Health Administration are the agencies responsible for assuring worker safety in the workplace.

Cal-OSHA assumes primary responsibility for developing and enforcing standards for safe workplaces and work practices. At sites known to be contaminated, a site safety plan must be prepared to protect workers. The site safety plan establishes policies and procedures to protect workers and the public from exposure to potential hazards at the contaminated site.

California Department of Forestry and Fire Protection

The California Public Resources Code (PRC) includes fire safety regulations that restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors[1] on construction equipment that has an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire-suppression equipment that must be provided onsite for various types of work in fire-prone areas. The California Public Resources Code requirements would apply to construction activities in any areas designated by the California Department of Forestry and Fire Protection as a Wildland Area that May Contain Substantial Forest Fire Risks and Hazards pursuant to Section 4125 (CDF, 2000).

Electric and Magnetic Fields

No federal regulations have established environmental limits on the strengths of fields from powerlines. The State of California Department of Education enacted regulations that require minimum distances between a new school and the edge of a transmission line right-of-way (ROW). The setback distances are 100 feet from the edge of the transmission line ROW for 50- to 133-kilovolt (kV) lines, 150 feet from the edge of the transmission line ROW for 220- to 230-kV lines, and 350 feet from the edge of the transmission line ROW for 500- to 550-kV lines. These distances were not based on specific biological evidence, but on the fact that fields from powerlines drop to near background levels at those distances.

In 1993, the California Public Utilities Commission (CPUC) authorized the state's investor-owned utilities to implement "no and low-cost EMF avoidance measures" in the construction of new and upgraded utility projects. A CPUC decision on January 27, 2006, affirmed the Commission's November 1993 decision on a low-cost/no-cost policy to mitigate EMF exposure for new utility transmission and substation projects. As a measure of low-cost mitigation, the CPUC continues to use the benchmark of 4 percent of transmission and substation project costs for EMF mitigation, and to combine linked transmission and substation projects. In addition, the CPUC adopted rules and policies to improve utility design guidelines for reducing EMF levels near areas of human habitation; these guidelines include use of alternative sites, increased ROW, placement of facilities underground, and similar methods to reduce EMF levels at transmission, distribution,

[1] A spark arrestor is a device that prohibits exhaust gases from an internal combustion engine from passing through the impeller blades where they could cause a spark. A carbon trap is commonly used to retain carbon particles from the exhaust.

and substation facilities by increasing the distance between people and facilities. As a federal agency, Western Area Power Administration (Western) is not subject to state regulations related to EMF.

California has no other rules governing EMF; however, CPUC-regulated utilities and municipal utilities use ratepayer funds to pay for their share of EMF research development costs. A $5.6 million, 4-year, non-experimental research program to be directed by Cal-OSHA was included in CPUC's January 27, 2006, decision. This program will provide utility participation in state, national, and international research to benefit ratepayers.

Local

Emergency Response

California has developed an emergency response plan to coordinate emergency services provided by federal, state, and local government and private agencies. Responding to hazardous materials incidents is one part of this plan, as is responding to intentional acts of destruction. Another part involves development of a downstream evacuation plan for areas within the potential inundation area. For both Contra Costa County and Alameda County, the plan is administered by the California Office of Emergency Services, which coordinates the responses of other agencies, including the California Environmental Protection Agency, CHP, California Department of Fish and Game, Regional Quality Control Board, and local fire departments. CCWD has a Los Vaqueros Reservoir Emergency Evacuation Plan for the current facility, discussed in Section 4.5 Local Hydrology, Drainage and Groundwater, Impact 4.5.5, which addresses the potential for inundation by dam or levee failure.

Contra Costa County also adopted the *Contra Costa County Hazardous Materials Area Plan*, which outlines the procedures that County regulatory and response agencies will use to coordinate management, monitoring, containment, and removal of hazardous materials in the event of an accidental release (Contra Costa County, 1996). Alameda County administers similar programs such as the *Hazardous Materials Business Plan Program* and the *California Accidental Release Program*. The former establishes minimum statewide standards for Hazardous Materials Business Plans, and the accidental release program requires businesses that handle more than threshold quantities of an extremely hazardous substance to develop a Risk Management Plan. Contractors for large public works projects that use fuels and other hazardous materials are required to develop Hazardous Materials Business Plans.

Contra Costa County

The Contra Costa County General Plan contains goals and policies to ensure public safety from hazardous materials in the county. These goals and policies include the regulation of stored hazardous materials and wastes (10-62); the required secondary containment and examination of stored toxic materials (10-63); the development of fire protection and prevention requirements for open space and rural area development (7-71); and the encouragement of wildland fire prevention activities (7-80) (Contra Costa County, 2005). Specific Contra Costa County goals and policies are listed in Appendix E-2.

Alameda County General Plan – East County Area Plan

The East County Area Plan (ECAP) addresses hazards, including wildland fires and airport hazards. The purpose of this plan is "to present a clear statement of the County's intent concerning future development and resource conservation within East County." The main policy relevant to the proposed project requires adherence to the provisions of the Alameda County Fire Protection Master Plan and Fire Hazard Mitigation Plan (319) (Alameda County, 2002). Specific ECAP goals and policies are listed in Appendix E-1.

Environmental Setting

Hazardous Materials

In accordance with federal and state laws, materials (including wastes) may be considered hazardous if they are specifically listed by statute as such or if they are poisonous (toxic); if they can be ignited by open flame (ignitable); if they can corrode other materials (corrosive); or if they can react violently, explode, or generate vapors when mixed with water (reactive). The term "hazardous material" is defined by law as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment.[2]

In some cases, past industrial or commercial activities at a site could have resulted in hazardous materials spilling or leaking to the ground, resulting in soil and/or groundwater contamination. Federal and state laws require that hazardous materials be specially managed and that excavated soils with concentrations of contaminants, such as lead, gasoline, or industrial solvents that are higher than certain acceptable levels be specially managed, treated, transported, and/or disposed of as a hazardous waste. The California Code of Regulations, Title 22, Section 66261.20-24 contains technical descriptions of characteristics that would cause a soil to be designated a hazardous waste. The California regulations are compliant with the federal regulations and in most cases are more stringent.

Hazard, Risk, and Exposure

Factors that influence the health effects of exposure to hazardous material include the dose to which a person is exposed, the frequency of exposure, the exposure pathway, and individual susceptibility. The means by which an individual is exposed to a chemical agent is classically defined through the four basic exposure pathways: inhalation, ingestion, bodily contact, and injection.

The proposed project facilities are in southeastern Contra Costa County and northeastern Alameda County in an area that includes primarily open space and agricultural land, the majority of which is used for grazing. The closest communities to any project component are the towns of Byron and Discovery Bay, at distances of 4 and 6 miles, respectively, east/northeast and northeast from the Los Vaqueros Reservoir Watershed. The town of Byron has a relatively small population (fewer than 900 residents) and includes residential, commercial, and light industrial land uses. Discovery Bay, with about 9,000 residents, is known for its residential and water-based

2 State of California, Health and Safety Code, Chapter 6.95, Section 25501(o).

recreation land uses. None of the project facilities would be in the towns of Byron or Discovery Bay, although the Delta–LV Pipeline extends along SR 4, which bounds the Discovery Bay community on the south.

Existing hazardous materials use in the project region varies and likely includes petroleum hydrocarbons and those hazardous materials common to agriculture, including pesticides, fertilizers, and fuels. Historical hazardous materials use likely involved the application of pesticides on the agricultural lands used for growing crops. Hazardous materials may also be present in surface soils along roadways as a result of accidental releases. In addition, subsurface soil or groundwater contamination related to hazardous material use is present in isolated commercial and light industrial properties throughout the region, discussed in the following paragraphs

In March 2007, Environmental Data Resources (EDR), Inc. conducted a review of regulatory agency databases for the project area to inventory sites of past hazardous materials releases (see **Table 4.13-1**) (EDR, 2007a and 2007b). The EDR database review was supplemented with a review of the online database, Geotracker, maintained by the State Water Resources Control Board (SWRCB, 2007), the Cortese List/Envirostor database maintained by the State Department of Toxic Substances Control (DTSC, 2007), and the Hazardous Materials Incident Search database produced by the Contra Costa County Hazardous Materials Program (CCCHMP, 2007).

The EDR database review identified four known or potential areas of contamination within a 1-mile radius of the proposed Transfer-Bethany Pipeline. Most of these areas would not affect or be affected by project construction because of their distances from the pipeline alignment. The closest recorded site to any of the proposed project components is the Souza Ranch landfill, which is an active facility that disposes of biosolids. This permitted landspreading[3] facility is between Armstrong Road and Vasco Road, about a quarter mile east of the proposed Transfer-Bethany Pipeline. No violations or areas of concern are reported for this facility. In and around Byron Airport, there are other similar landspreading facilities, but they are farther away from the proposed Transfer-Bethany Pipeline and more than 1 mile from the Western Transmission Line or any of the other Power Supply elements.

Other potential sites where hazardous materials are handled close to the proposed project components include a relatively new gasoline service station at the northeast corner of Bixler Road and SR 4, and next to the proposed Delta-Transfer Pipeline; a boat-storage yard at the southwest corner of that same intersection, also next to the proposed Delta-Transfer Pipeline; and the Unimin sand plant at the southwest corner of the intersection of Vasco Road and Camino Diablo Road, next to the proposed Transfer-Bethany Pipeline. However, none of these facilities were listed on any of the databases reviewed, which indicates that no reported leaks or spills are associated with these sites. In addition, according to the available databases reviewed as part of this analysis, no hazardous materials leaks or spills have occurred within the Los Vaqueros Watershed.

3 Landspreading organic material involves incorporating the materials into the soil where they are biologically broken down and remain in the soil as nutrients.

TABLE 4.13-1
DESCRIPTION OF ENVIRONMENTAL DATABASES

Acronym / Permitted Uses	Name and Description of Database
CONTRA COSTA Sites	Contra Costa County Hazardous Materials Incident Search. Sites in Contra Costa County with Underground Storage Tanks (USTs) as well as hazardous waste generators and facilities that have submitted a hazardous materials business plan.
DRY CLEANERS	The Dry Cleaner Facilities Database. Dry cleaner-related facilities that have U.S. EPA identification numbers.
CA SLIC	Spills, Leaks, Investigation, and Cleanup Cost Recovery Listing. Sites under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board. Found on the Geotracker Database.
CALSITES	Previously referred to as the Abandoned Sites Program Information System (ASPIS), this list identifies potential hazardous waste sites, which are then screened by the DTSC for further action. Now replaced by DTSC's Envirostor.
NPL	National Priorities List compiles over 1,200 sites for priority cleanup under the Superfund Program.
CORTESE	Cortese Hazardous Waste and Substances Site List. A compilation of sites listed in the LUST, Solid Waste Information System (SWF/LF), and CALSITES databases.
LUST	Leaking Underground Storage Tanks (LUST). A compilation of LUST sites.
REF	Unconfirmed Properties Referred to Another Agency. Properties where contamination has been confirmed and that were determined not to require direct DTSC Site Mitigation Program action or oversight.
VCP	Voluntary Cleanup Program Properties. Low-threat properties with either confirmed or unconfirmed releases, where the project proponents have requested that the DTSC oversee investigation and/or cleanup activities.
US Brownfields	Maintained by the U.S. EPA, the US Brownfields database lists abandoned sites that have known or suspected contamination that are currently underutilized.
Toxic Pits	Maintained by the State Water Resources Control Board, the Toxic Pits database lists sites suspected of containing hazardous substances that have not yet been cleaned up.
State Landfill	Solid waste facilities and landfills that are active, closed, or inactive.
Indian LUST	Leaking underground storage tanks on Indian lands.

ASPIS: Abandoned Sites Program Information System
DTSC: Department of Toxic Substances Control
LUST: Leaking Underground Storage Tanks
SWF/LF: Solid Waste Information System
UTS: Underground Storage Tank

SOURCE: EDR, 2007a and 2007b.

Naturally Occurring Asbestos

Asbestos is a naturally occurring fibrous group of minerals. Chrysotile, which is found in the serpentine group,[4] is the most common asbestos mineral in California. Small amounts of chrysotile asbestos, a fibrous form of serpentine minerals, are common in serpentinite. When disturbed, the asbestos fibers can become airborne and present a public health risk when inhaled. The California Geological Survey has mapped California for the occurrence of ultramafic rocks, which have the

4 Serpentine is a naturally occurring group of minerals that can be formed when ultramafic rocks are metamorphosed during uplift to the earth's surface. Serpentinite is a rock consisting of one or more serpentine minerals. This rock type is commonly associated with ultramafic rock along earthquake faults.

highest potential for serpentine. A review of the map shows that the proposed project elements are not anywhere near these mapped locations; therefore, the potential for encountering naturally occurring asbestos during construction is considered very low (CGS, 2000).

Wildland Fire

The California Department of Forestry and Fire Protection has identified two types of wildland fire risk areas: (1) Wildland Areas That May Contain Substantial Forest Fire Risks and Hazards, and (2) Very High Fire Hazard Severity Zones. Each risk area contains requirements to reduce the potential risk of wildland fires fire safety, such as through regulations that restrict the use of equipment that may produce a spark, flame, or fire; that require the use of spark arrestors on construction equipment with an internal combustion engine; that specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and that specify fire-suppression equipment that must be provided onsite for various types of work in fire-prone areas.

The proposed project facilities lie partially within an area considered to be a Wildland Area That May Contain Substantial Forest Fire Risks and Hazards. The majority of the open space west of the Byron Highway/railroad tracks is mapped as a hazard area (CDF, 2000). No Very High Fire Hazard Severity Zones are within the project vicinity. Therefore, public safety requirements to minimize the risk of wildland fire would apply to construction activities within the Los Vaqueros Watershed (including construction areas for the Dam Raise, appurtenant facilities, and borrow areas). Affected conveyance facilities include the western portion of the Delta-Transfer Pipeline; Transfer Facility Expansion; Transfer-LV Pipeline; and the western portion of the Transfer-Bethany Pipeline. Power Supply Option 2 (Western & Pacific Gas and Electric [PG&E]), with a potential new PG&E substation, would also be in the identified wildland fire hazard area. The proposed recreation facilities are within the CCWD watershed and would be subject to these code requirements as well.

Electric and Magnetic Fields

Electrical transmission facilities generate EMF. The possibility of adverse health effects from EMF exposure has increased public concern in recent years about living near high-voltage transmission lines. The available evidence has not established that such fields pose a significant health hazard to exposed humans. Therefore, in light of present uncertainty, CPUC guidelines are incorporated into the design of new facilities to reduce such fields through no cost and low cost (up to 4 percent of facility cost) measures until the issue is better understood.

As stated in the Regulatory Setting, guidelines adopted by the CPUC include use of alternative sites, increased ROW, placement of facilities underground, and similar methods to reduce EMF levels at transmission, distribution, and substation facilities by increasing the distance between electrical facilities and human habitation areas. As previously discussed, no federal or state regulations have established environmental limits on the strengths of fields from powerlines. Furthermore, as a federal agency, Western is not subject to state regulations; however, Western may voluntarily incorporate CPUC requirements into a project design. Additional background information is provided prior to the discussion of possible EMF effects.

Both voltage and current are required to transmit electrical energy over a transmission line. Voltage represents the potential for an electrical charge to do work and is measured in volts (V) or kV. Voltage is the source of an electrical field. Current, a flow of electrical charge measured in amperes, is the source of a magnetic field.

All transmission lines generate EMF. The existing and new transmission lines would generate similar EMF. The electrical effects of a transmission line can be characterized as “corona effects” and “field effects.” Corona is the electrical breakdown of air into charged particles. It is caused by the electrical field at the surface of conductors. Field effects are induced currents and voltages, as well as related effects that might occur due to EMF at ground levels. Issues of concern related to EMF include: human health and safety hazards from direct and cumulative EMF exposure, EMF effects on livestock, and television interference.

Corona Effects

Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations in which the field has been enhanced by protrusions, such as nicks, insects, dust, or drops of water. During fair weather, the number of these sources is small, and the corona effect is less than significant. However, during wet weather, the number of these sources increases and corona effects are much greater. Effects of corona are audible noise, radio and television interference, visible light, and photochemical reactions.

Field Effects

The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, transmission structures, vegetation, buildings, vehicles, and persons. The electric field is measured in units of kV/meter, at a height of 1 meter above ground level. Field effects can include induced currents, steady-state current shocks, spark discharge shocks and, in some cases, field perception.

Induced Currents. When a conduction object, such as an ungrounded fence, vehicle, or person is placed in an electric field, current and voltages are induced. The magnitude of the induced current depends on the electric field strength and the size and shape of the object. The induced currents and voltages represent a potential source of nuisance shocks near a high-voltage transmission line. Typically, high-voltage transmission lines are placed high above objects to reduce the potential for nuisance shocks. In addition, permanent structures near transmission lines, such as fences, gates, and metal buildings, are grounded.

Spark-Discharge Shocks. If the induced voltage was sufficiently high on an ungrounded object, a spark-discharge shock would occur as contact is made with the ground. Under typical transmission line design practices, the magnitude of the electric field would be low enough that this type of shock would occur rarely, if at all. Carrying or handling conducting objects, such as irrigation pipes, under transmission lines can result in spark discharges that are a nuisance. The primary hazard with irrigation pipes or any other long objects, however, is electrical flashover from the conductors if a section of the pipe is inadvertently tipped up near the conductors.

Steady-State Current Shocks. Steady state currents are those that flow continuously after a person contacts an object, such as an ungrounded fence, and provides a path to the ground for the induced current. The effects of these shocks may include involuntary movement of a person.

Field Perception and Neurobehavioral Responses. When the electric field under a transmission line is sufficiently strong, it can be perceived by hair rising on the back of one's hand. At locations directly under the conductors, it is possible for some individuals to perceive the field while standing on the ground. Perception of the field does not occur at or beyond the edge of a ROW.

Magnetic Field

A 60-hertz magnetic field is created in the space around transmission-line conductors by the electric current flowing in the conductors. The magnetic field is expressed in units of microteslas (μT) and in gauss or milligauss (mG), where 1 mG is one thousandth of a gauss (1 μT = 10mG). The maximum magnetic fields of transmission lines are similar to the maximum magnetic fields measured near some common household appliances. The actual level of the magnetic field would vary as the current on the transmission line and the distance to the line varies. There are no established health-based limits exist for peak magnetic fields. A possible short-term effect associated with magnetic fields from alternating current transmission lines is induced voltages and currents in long-conducting objects such as ungrounded fences and above-ground pipelines.

Health Effect

Before health-based concern developed, measures to reduce field effects from powerline operations were mostly aimed at the electric field component, which can cause radio noise, audible noise, and nuisance shocks. The present focus is on magnetic fields, because these can penetrate building materials and potentially produce the types of health impacts at the root of the present concern.

It is important to note that an individual in a home could be exposed for short periods to much stronger fields while using some common household appliances (NIEHS, 2002). There is also discussion of cell phones as a source of EMF, although it is measured in relatively low levels. Scientists have not established which types of exposures would be more biologically meaningful. High-level magnetic field exposures regularly occur in areas other than the powerline environment. Examples of magnetic fields at particular distances from household appliance surfaces are listed in **Table 4.13-2**.

As described in Section 3.5.5 Power Supply Infrastructure, Alternatives 1, 2, and 3 would involve construction of new power supply facilities to support the operation of the expanded Los Vaqueros system. New electrical transmission lines would be extended to the new Delta Intake and Pump Station under Alternatives 1 and 2, and to the Expanded Transfer Facility under Alternatives 1, 2, and 3. A new electrical substation would be required in the project area under Alternatives 1, 2, and 3, depending on which of two power supply options is adopted. No new power supply facilities are included in Alternative 4.

TABLE 4.13-2
MAGNETIC FIELDS FROM HOUSEHOLD APPLIANCE SURFACES

Appliance	Milligauss at 1 foot	Milligauss at 3 feet
Can opener	7.19 to 163.02	1.3 to 6.44
Clock	0.34 to 13.18	0.03 to 0.68
Clothes iron	1.66 to 2.93	0.25 to 0.37
Coffee machines	0.09 to 7.30	0 to 0.61
Computer monitor	0.20 to 134.7	0.01 to 9.37
Dishwasher	4.98 to 8.91	0.84 to 1.63
Fax machines	0.16	0.03
Portable fan	0.04 to 85.64	0.03 to 3.12
Range	0.60 to 35.39	0.05 to 2.83
Television	1.80 to 12.99	0.07 to 1.11

SOURCE: Zaffanella, 1997

Two options for provision of this additional power supply are evaluated. Under Power Option 1, Western would extend additional transmission lines to both the new Delta Intake and Pump Station and the Expanded Transfer Facility from a new Western substation (see Figure 3-26). Under Power Option 2, PG&E would construct a new substation in the project area to extend power to the Expanded Transfer Facility (see Figure 3-27).

Power Option 1 (Western Only). Western would provide power to the new Delta Intake and Pump Station and the Expanded Transfer Facility. An existing 230-kV transmission line along Western's existing transmission corridor from Western's Tracy Substation to a new substation in the project area would not require any upgrades. From this proposed new substation a new 69-kV transmission line would be extended east to the new Delta Intake and Pump Station, next to the existing 69-kV line that extends to the existing Old River Intake and Pump Station. No residences are located along the alignment for the new 69-kV line that would extend from the substation to the new Delta Intake and Pump Station. At the new intake site, however, this new powerline would be a minimum of 500 feet from an existing farmhouse across Old River on Victoria Island.

The siting zone of the proposed 2-acre Western substation is at the eastern terminus of Camino Diablo Road, where Western's existing 230-kV towers end and the 69-kV power poles that extend to the Old River Pump Station begin. The new substation would have the capacity to step power down from 230 kV to 69 kV and 21 kV. A farmhouse is about 100 feet east of the existing transmission corridor; which contains two PG&E 500-kV lines as well as a 69-kV Western powerline. Because the 2-acre substation could be in any part of the siting zone, the substation could be as far as 1,275 feet from this house.

To serve the Expanded Transfer Facility under Option 1, a new 21-kV distribution line would be extended from the new substation west to the Transfer Facility. The new transmission line would parallel the existing 230-kV transmission line for a segment and then would extend westward, generally traversing the same alignment as the Delta-Transfer Pipeline to the Expanded Transfer Facility.

The proposed Delta-Transfer Pipeline would be constructed within an existing CCWD utility easement that contains an existing water pipeline. Within this utility ROW, the new 21-kV line could be within 50 feet of the closest homes on SR 4, Bixler Road, Kellogg Creek Road, and Hoffman Lane, potentially including Discovery Bay homes along SR 4.

Power Option 2 (Western & PG&E). Western would provide power to the new Delta Intake and Pump Station as described under Option 1. PG&E would provide power to the Expanded Transfer Facility through a new PG&E distribution substation constructed in the Los Vaqueros Watershed. This new substation would have the capacity to step power down from an existing 230-kV PG&E transmission line to a 21-kV powerline. The closest residence to the proposed substation would be over 1,500 feet to the north.

The approximately 1.5-mile-long, 21-kV distribution line would begin at the proposed 230-kV PG&E substation about 2,600 feet south of the intersection of Walnut Boulevard and Camino Diablo Road. It would follow an existing distribution line route west, cross Walnut Boulevard, and head north, paralleling Walnut Boulevard to the intersection of Camino Diablo Road. From there it would cross Walnut Boulevard and traverse east on the south side of Camino Diablo, cross Camino Diablo Road and traverse north on the west side of Longwell Avenue, and cross Kellogg Creek and traverse on the north side of an existing access road on the Expanded Transfer Facility property. The proposed 21-kV transmission lines would pass as close as 50-feet west of homes on Walnut Boulevard.

For the new electrical transmission facilities, EMF, measured under the lines and at the edge of the utility ROW, would vary, depending upon the configuration of the circuits and operation of the lines. Circuits placed parallel to each other tend to cancel EMF, thus reducing the measured fields under the lines and at the edge of the ROW. Fields and currents can be induced on nearby ungrounded fences, irrigation pipes, and other metallic objects.

4.13.2 Environmental Consequences

Methodology

Analysis of the potential for construction activities associated with the project to encounter subsurface hazardous materials was conducted by reviewing the land uses and databases that describe past hazardous materials releases in light of the proposed facility site locations. The discussion also addresses the potential for discovery of unreported hazardous materials releases.

Analysis of the project's potential to release hazardous materials was conducted by identifying the hazardous materials that would be used for the project, estimating the general quantity of such materials, and assessing the risk of a release. Impacts on emergency response/evacuation were analyzed by reviewing the relevant plans and identifying any conflict with these plans. Impacts on wildland fire risk were analyzed by comparing the state's fire risk maps to the project facilities site locations. Finally, potential for EMF effects associated with the proposed electrical transmission facilities is based on the distance of these facilities from schools.

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State California Environmental Quality Act (CEQA) Guidelines. These thresholds also encompass the factors taken into account under the National Environmental Policy Act (NEPA) to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect on hazardous materials and public health if it would do any of the following:

- Expose construction workers to hazardous materials that would create health risks during construction
- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, or through reasonably foreseeable upset or accident conditions involving their release into the environment
- Emit hazardous emissions or involve the handling of hazardous or acutely hazardous materials, substances, or waste within a quarter mile of an existing or proposed school (not analyzed in this section)
- Be on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code 65962.5
- Expose people or structures to a significant risk of loss, injury, or death from wildland fires
- Locate electrical transmission facilities less than 150 feet from the property line of an existing or approved school site
- Result in a safety hazard for people residing or working in a project area that is within 2 miles of a public airport or public-use airport (not analyzed in this section)
- Impair implementation of or physically interfere with Alameda County and/or Contra Costa County's emergency response and evacuation plans (not analyzed in this section)

No acutely hazardous materials would be used in project construction or operations, and none of the proposed project facilities where hazardous materials (such as fuels) might be used in operations, would be built within a quarter mile of an existing or proposed school. Therefore, this issue is not addressed further in this impact analysis.

The nearest airport to the proposed project facilities is the Byron Airport (a public airport), which is about 5 to 6 miles east of Los Vaqueros Reservoir and about 1 mile east of the proposed Transfer-Bethany Pipeline. Construction activities near the Byron Airport are discussed in Section 4.7 Land Use, under Impacts 4.7.3 and 4.7.4. Therefore, this issue is not addressed further in this impact analysis.

None of the project components would be constructed on a site that is included on any list of hazardous materials sites, including the list compiled pursuant to Government Code section 65962.5. Accordingly, the effects of construction on such a site are not discussed further in this section.

Most proposed project components are outside of road ROW or other evacuation routes and would not interfere with any emergency response plans or evacuation plans. The Reservoir Expansion/Dam Modification and recreation facilities are within the CCWD watershed. Outside of the watershed property, most of the facilities would be underground pipelines or structures on CCWD property (i.e., Delta Intake Facilities and Transfer Facility Expansion). Exceptions include Power Supply transmission poles and new substations. Because overhead powerlines are easily traversable by roads and the project components are relatively dispersed across the large project area and would not otherwise interfere with implementation of any emergency response plans or evacuation plans, this topic is not discussed further in this section. See also Section 4.9 Transportation and Circulation, Impact 4.9.2, for additional discussion of emergency vehicle access and Mitigation Measure 4.9.2, which addresses requirements of a project traffic control and safety assurance plan.

Impact Summary

Table 4.13-3 provides a summary of the impact analysis for issues related to hazardous materials/public health based on actions outlined in Chapter 3.

TABLE 4.13-3
SUMMARY OF IMPACTS – HAZARDOUS MATERIALS / PUBLIC HEALTH

	Project Alternatives			
Impact	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.13.1: Construction of the project and alternative components would disturb subsurface soils and groundwater; if hazardous substances are present in the disturbed areas, construction workers and the public could be exposed to these substances.	LS	LS	LS	LS
4.13.2: Project construction and operation could, through routine transport, use or disposal, accidentally release hazardous materials, thereby exposing construction workers, project personnel, and the public to hazardous materials, or accidentally releasing hazardous materials into the soil, groundwater, and/or a nearby surface water body.	LSM	LSM	LSM	LSM
4.13.3: Improper handling or use of flammable or combustible materials such as internal combustion equipment could result in wildland fires, exposing people or structures to a significant risk of loss, injury, or death.	LSM	LSM	LSM	LSM
4.13.4: Construction and operation of project power supply facilities would not locate electrical transmission facilities within 150 feet of a school.	NI	NI	NI	NI
4.13.5: The project alternatives would not contribute to cumulative impacts associated with release of hazardous materials or other hazards.	LS	LS	LS	LS

SU = Significant and Unavoidable
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project / No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed. Therefore, this alternative would not result in any impacts on public health or safety related to hazards or hazardous materials.

Impact 4.13.1: Construction of the project and alternative components would disturb subsurface soils and groundwater; if hazardous substances are present in the disturbed areas, construction workers and the public could be exposed to these substances. (Less than Significant)

Alternative 1

The proposed areas of ground disturbance would be in rural and agricultural areas of eastern Contra Costa and Alameda Counties. None of the project components would be within the towns of Byron or Discovery Bay. Although most of the project area has not been used for commercial, industrial or other urban uses, and large portions are used as open grazing land, some of the project components could be in or near areas with a history of hazardous materials use. If areas of contamination were encountered, construction workers and potentially the public would be exposed to contaminated soil particulates and, potentially, to chemical vapors.

Reservoir Expansion and Recreational Facilities. Alternative 1 involves a 275 thousand acre-feet (TAF) Reservoir Expansion/Dam Modification with borrow areas, and recreation facilities constructed within CCWD watershed property lines. Review of available environmental regulatory databases for known current and historical sites of hazardous materials storage, generation, use, and/or disposal did not reveal any known sites within CCWD property, including any areas proposed for construction.

Delta Intake Facilities. Construction of a new Delta Intake and Pump Station would occur in an agricultural area apart from existing communities and other sensitive land uses. Review of available environmental regulatory databases for known current and historical sites of hazardous materials storage, generation, use, and/or disposal did not reveal any known sites near the proposed site of the new Delta Intake Facility.

Conveyance Facilities. Under Alternative 1, construction of three water conveyance pipelines and expansion of the existing Transfer Facility would occur. The Delta-Transfer Pipeline would lie along SR 4 within an existing transportation corridor. The Transfer Facility Expansion would occur on CCWD land next to the existing Transfer Facility. The Transfer-LV Pipeline alignment would also use an existing roadway corridor. The Transfer-Bethany Pipeline would pass south along Vasco Road and then over range land into Alameda County.

According to a review of environmental databases, the closest database site to any of the proposed project components is the Souza Ranch landfill at 6100 Armstrong Road, east of North Vasco Road. This landfill is about a quarter mile east of the proposed Transfer-Bethany Pipeline.

This permitted active facility disposes of sludge (biosolids) and has no reported violations or areas of concern. In and around the Byron Airport, there are other similar landspreading facilities, including the Byron Hot Springs Landspreading and the Airport Ranch Sludge Spreading facilities. Byron Hot Springs Landspreading is at 5400 Byron Hot Springs Road, which is about 1.5 miles east of the proposed Transfer-Bethany Pipeline. The Airport Ranch Sludge Spreading facility is at Holey Road, almost adjacent to the Byron Airport and about 2 miles east of the proposed Transfer-Bethany Pipeline. However, there are no reported violations or areas of concern for any of these facilities, which are, in any event, at distances that would be unlikely to affect construction activities associated with the proposed project.

There are also no reported spills or leaks associated with the other nearby sites, such as the service station at Bixler Road and SR 4, the boat storage yard, and the Unimin sand plant. Based on the lack of any identified release associated with these facilities, their potential to affect humans at the proposed project elements is considered very low.

Power Supply. To accommodate a new Delta Intake and Pump Station as well as the expansion of the Transfer Facility, additional overhead electrical powerlines and a substation would be required. Two options for electrical facilities currently under consideration include Power Options 1 and 2. Construction of Power Option 1 includes a new powerline from the Western substation to the new Delta Intake facilities, with a new Western substation at the eastern terminus of Camino Diablo Road. Power Option 2 would entail a new PG&E substation within the CCWD watershed property in an area to the north of the staging area, plus a new distribution line connecting the new PG&E substation to the expanded Transfer Facility. Review of available environmental regulatory databases for known current and historical sites of hazardous materials storage, generation, use, and/or disposal did not reveal any known sites within a mile of the power supply facilities.

Unforeseen Hazardous Conditions. Existing federal, state and local worker safety and emergency response regulations (see subsection 4.13.1) require that if any unforeseen hazardous conditions are discovered during construction, the contractor coordinate with the appropriate agencies for the safe handling, sampling, transportation, and disposal of encountered materials. Alameda and Contra Costa counties have adopted County Hazardous Materials Area Plans (for their respective jurisdictions) that outline the procedures that county regulatory and response agencies will use to coordinate management, monitoring, containment, and removal of hazardous materials in the event of an accidental release (Contra Costa County, 1996). The contractor would also be required to comply with Cal-OSHA worker health and safety standards that ensure safe workplaces and work practices. The impacts of Alternative 1 would be less than significant.

Alternative 2

The facilities included in Alternative 2 would be the same as those under Alternative 1. Therefore, the impacts of Alternative 2 would be less than significant.

Alternative 3

Construction of Alternative 3 would include the same components as Alternative 1, except that expansion of the Old River Intake and Pump Station would occur within the facility's existing site area and Alternative 3 would not include a new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. As such, no database sites are identified at or next to Alternative 3 project components. As with Alternatives 1 and 2, the impacts of Alternative 3 would be less than significant.

Alternative 4

Alternative 4 would involve a 160-TAF Reservoir Expansion/Dam Modification with two borrow areas and recreational facilities to be constructed within CCWD watershed property lines. Under this alternative, the existing Transfer Facility would be upgraded; but this facility would not expand its footprint as would occur for other alternatives.

Alternative 4 would exclude construction of any Delta Intake and Pump Station, Conveyance or Power Supply facilities, and would avoid ground disturbance in areas with hazardous materials. As with Alternatives 1, 2, and 3, the impacts of Alternative 4 would be less than significant.

Mitigation: None required.

Impact 4.13.2: Project construction and operation could, through routine transport, use or disposal, accidentally release hazardous materials, thereby exposing construction workers, project personnel, and the public to hazardous materials, or accidentally releasing hazardous materials into the soil, groundwater, and/or a nearby surface water body. (Less than Significant with Mitigation)

Alternative 1

Under Alternative 1, there would be construction and operation activities that would require use of limited quantities of hazardous materials such as fuels, oils, grease, lubricants, and glues. The improper use, storage, handling, or disposal of hazardous materials could allow hazardous releases from equipment or through other means during project construction or operation activities, thereby exposing construction workers and CCWD personnel to hazardous materials. There could also be accidental or intentional acts of destruction, including releases of hazardous materials that would contaminate soil or degrade water quality. The types and quantities of hazardous materials would vary throughout construction of the project but would likely involve minor quantities (less than 5 gallons) of miscellaneous substances (e.g., paint and solvents) at each work area and explosives at the borrow area.

The primary hazardous materials handled would be fuel, hydraulic fluid, and engine oil in quantities that would likely be in the range of hundreds of gallons over the course of construction. The most likely area for potential release of fuel, hydraulic fluid, oil, and other substances would be around the mechanics' yard. All hazardous materials would be contained and stored according to the manufacturer's recommendations and hazardous material storage requirements.

For construction of the Reservoir Expansion project and other stationary facilities, refueling the construction equipment could occur in one location on the construction site and, if access allows, the refueling vehicle may also be taken out to a piece of equipment. Routine maintenance and refueling would occur in available parking areas and major maintenance in the CCWD watershed mechanics yard. For the construction of pipelines, power poles, and other facilities that traverse the project area, the contractor will use a fuel vehicle to refuel construction equipment in a manner that protects water quality, as restricted under Mitigation Measure 4.5.1a. Regulatory compliance procedures would be in place to contain spillage during refueling and other maintenance.

For facility operations after construction is completed, CCWD would be required to update its existing permits and comply with appropriate regulations. For the purposes of maintenance during operations, the project would continue to handle and store limited quantities of hazardous materials such as paints, solvents, fuels, and oil, but in far smaller quantities than during construction. CCWD would update its existing *Emergency Response Plan and Hazardous Materials Business Plan,* which would state quantities stored and provide handling procedures to ensure the safety of workers and the public.

Due to the extent and duration of construction and the common use of hazardous materials such as fuels, oils, grease, lubricants, and glues during construction, Alternative 1 has the potential to expose people and the environment to accidental releases of hazardous substances, resulting in a significant impact.

Alternative 2

The facilities and construction procedures included in Alternative 2 would be the same as those in Alternative 1. Therefore, this alternative also has the potential to expose people and the environment to accidental releases of hazardous substances, resulting in a significant impact.

Alternative 3

Construction of Alternative 3 would include the same components and construction procedures as Alternative 1, except that expansion of the Old River Intake and Pump Station would occur within that facility's existing site area, and Alternative 3 would not include a new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. As with Alternative 1, Alternative 3 has the potential to result in exposing people and the environment to an accidental release of hazardous substance, resulting in a significant impact.

Alternative 4

Alternative 4 would involve a 160-TAF Reservoir Expansion/Dam Modification project with two borrow areas and recreational facilities to be constructed within CCWD watershed property lines. Under this alternative, the existing Transfer Facility capacity would be upgraded; however, this facility would not expand its footprint as would occur for the other alternatives. Alternative 4 would exclude construction of any Delta Intake and Pump Station, Conveyance, or Power Supply facilities and would avoid ground disturbance in areas with hazardous materials. Alternative 4 involves a smaller project that would require less time to complete construction. The same construction procedures would be in place, however, to prevent hazardous material spills. Alternative 4, like Alternative 1, could result in exposing people and the environment to accidental releases of hazardous substances; however, based on the overall reduction in construction time and equipment necessary, the potential impact would be reduced. This would be a significant impact.

Mitigation Measures

Implementation of Mitigation Hydrology Measures 4.5.1a and 4.5.1b: These measures involve protection of water quality.

Measure 4.13.2: CCWD will incorporate into the contract specifications that require the contractor to enforce strict onsite best management practices (BMPs) to keep hazardous materials from accidental release. These practices will include, without limitation, designating a central storage area to keep hazardous materials away from any waterways and storm drain inlets; refueling equipment in designated areas; containing contaminants away from any waterways or storm drain inlets; preparing a spill prevention, control, and countermeasure plan; and regularly inspecting construction vehicles for leaks.

Impact Significance after Mitigation: Less than Significant.

Impact 4.13.3: Improper handling or use of flammable or combustible materials such as internal combustion equipment could result in wildland fires, exposing people or structures to a significant risk of loss, injury, or death. (Less than Significant with Mitigation)

Alternative 1

The rural areas of Contra Costa and Alameda Counties in which the proposed project would be constructed are dominated by grasslands, shrublands, and woodlands. The relatively dry climate conditions make the fire regime rich with fuels, although areas with active grazing, agricultural irrigation, and landscape irrigation provide some fuel reduction. Wildland fires in this region are largely caused by human activities as opposed to lightning-ignited fires. The most likely source of an ignition from the proposed project would be from construction and construction-related activities, such as welding, re-fueling, or use of other fuel-motorized equipment.

As previously discussed in the Environmental Setting section, the proposed project elements of Alternative 1 lie partially within an a Wildland Area That May Contain Substantial Forest Fire Risks and Hazards (CDF, 2000). The majority of the open space west of the Byron Highway/railroad tracks is mapped as a hazard area. Affected conveyance facilities include the western portion of the Delta-Transfer Pipeline; Transfer Facility Expansion; Transfer-LV Pipeline; and the western portion of the Transfer-Bethany Pipeline. Power Option 2, with a potential new PG&E substation, would also be in the identified wildland fire hazard area as would the recreation facilities. As such, construction activities would be required to adhere to fire safety measures that restrict the use of equipment that may produce a spark, flame, or fire; require the use of spark arrestors on construction equipment that has an internal combustion engine; specify requirements for the safe use of gasoline-powered tools in fire hazard areas; and specify fire-suppression equipment that must be provided onsite for various types of work in fire-prone areas.

Due to the extent and duration of project construction as well as activities such as welding, re-fueling, and use of fuel-motorized equipment, Alternative 1 has the potential to expose people and structures to wildland fires. This impact would be significant.

Alternative 2

The facilities and construction procedures included in Alternative 2 would be the same as those in Alternative 1. Therefore, this alternative has the potential to expose people and structures to wildland fires. This impact would be significant.

Alternative 3

Construction of Alternative 3 would include the same components and construction procedures as Alternative 1, except that expansion of the Old River Intake and Pump Station would occur within that facility's existing site area and Alternative 3 would not include a new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. As with Alternative 1, Alternative 3 has the potential to expose people and structures to wildland fires. This impact would be significant.

Alternative 4

Alternative 4 would involve a 160-TAF Reservoir Expansion/Dam Modification project, with two borrow areas and recreational facilities to be constructed within CCWD watershed property lines. Under this alternative, the existing Transfer Station capacity would be expanded; however, this facility would not expand its footprint as would occur for other alternatives. Alternative 4 would exclude construction of any Delta Intake and Pump Station, Conveyance or Power Supply facilities, and would avoid ground disturbance in areas with hazardous materials. Alternative 4 involves a smaller project that would require less time to construct and cover an overall smaller footprint. However, as with Alternative 1, this alternative has the potential to expose people and structures to wildland fires. This impact would be significant.

Implementation of Mitigation Measure 4.13.3 would reduce the potential for wildfire risks to less-than-significant levels.

Mitigation Measures

> **Measure 4.13.3:** CCWD will incorporate into contract specifications the requirement that the contractor enforce strict onsite BMPs to reduce the potential for accidental fires.
>
> 1) All equipment used during construction must have an approved spark arrestor.

2) The contractor/staff responsible for construction will submit a Fire Safety Plan for review by the Contra Costa County Fire Prevention Bureau. This plan will include precautions to carry out during high-fire danger, a list of fire-suppression equipment and tools to have on hand, a description of available communications, specifications for the supply of water to have on hand, and descriptions of other actions that will reduce the risk of ignition and facilitate immediate control of an incipient fire.

3) Ensuring easily accessible fire-suppression equipment is available at all work locations.

Impact Significance after Mitigation: Less than Significant.

Impact 4.13.4: Construction and operation of project power supply facilities would not locate electrical transmission facilities within 150 feet of a school. (No Impact)

Alternative 1

New transmission lines and other power facilities would be constructed as part of the Los Vaqueros Reservoir Expansion Project; therefore, EMF levels would increase and there would be some potential for increased exposure by people and the environment to EMF.

However, as indicated in Section 4.13.1, Affected Environment, there are no federal or state regulations governing EMF except near schools and no regulations have established environmental limits on the strengths of fields from powerlines. The State of California Department of Education regulations require minimum distances between a new school and the edge of a transmission line ROW. The setback distances are 150 feet from the edge of the transmission line ROW for 230-kV lines, which are the largest lines associated with the project. Since none of the project components would be within a quarter mile of an existing or proposed school, this criterion would be met and there would be no impacts related to EMF.

Alternative 2

Power Options 1 and 2 facilities and construction procedures that are included in Alternative 2 would be the same as those under Alternative 1. Impacts related to EMF would be no impact.

Alternative 3

Construction of Alternative 3 would include the same components and construction procedures as Alternative 1 except that the Old River Intake and Pump Station would be expanded and there would be no construction of the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. As with Alternative 1, no new facilities would be within 150 feet of an existing or proposed school. Impacts related to EMF would be no impact.

Alternative 4

Alternative 4 would involve a 160-TAF Reservoir Expansion/Dam Modification project with two borrow areas and multiple recreational facilities to be constructed within CCWD watershed property lines. Under Alternative 4, there would not be any new power supply facilities constructed and, therefore, there would be no impacts related to EMF.

Mitigation: None required.

Cumulative Effects

Impact 4.13.5: The project alternatives would not contribute to cumulative impacts associated with release of hazardous materials or other hazards. (Less than Significant)

Construction of the project under all alternatives would disturb subsurface soils and groundwater during site preparation and building of reservoir facilities, excavation for pipelines and other construction activities (Impact 4.13.1). If contaminated soils or hazardous substances were present in the disturbed areas, construction workers and the public could be exposed to these substances; however, there is no recorded indication that contaminated sites or hazardous substances are within areas to be disturbed. Therefore, there would be limited opportunity for the project alternatives to contribute to cumulative impacts associated with exposure to hazardous materials.

Most construction projects, like the proposed Los Vaqueros Reservoir Expansion project, would involve the storage, use, disposal, and transport of hazardous materials to varying degrees during construction and operation. Most potential hazards and hazardous materials impacts associated with the storage, use, disposal, and transport of materials are extensively regulated by various federal, state and local agencies. Accidental spill or contamination impacts (Impact 4.13.2) would be focused at individual facility locations and construction activities would be required to implement BMPs to keep hazardous materials from being accidentally released (Mitigation Measure 4.13.2).

In the same manner as other hazardous materials, use of flammable and combustible materials (such as internal combustion equipment) is extensively regulated by various federal, state and local agencies to reduce chances of starting wildland fires (Impact 4.13.3). Contract specifications that require the contractor to enforce strict onsite BMPs would be placed specifically at individual facility locations and construction activities to reduce the potential for accidental fires (Mitigation Measure 4.13.3).

As for the potential for the project alternatives to contribute to cumulative impacts associated with EMF (Impact 4.13.4), it is recognized by the CPUC that EMF fields from power supply facilities drop to near background levels in relatively short distances. Construction and operation of project power supply facilities would not locate electrical transmission facilities near any schools; therefore, there would be no opportunity for the project alternatives to contribute to cumulative impacts associated with exposure to EMF.

The proposed project would not make a cumulatively considerable contribution to any significant cumulative impact related to hazardous materials or public health due to the site-specific nature of the potential impacts and the required implementation of BMPs to avoid accidental hazardous material spills and wildland fires. Cumulative impacts would be less than significant.

Mitigation: None required.

4.14 Visual/Aesthetic Resources

This section presents an analysis of potential impacts on visual/aesthetic resources that would result from implementation of the Los Vaqueros Reservoir Expansion Project. The analysis includes a description of visual/aesthetic resources in the project area, the associated regulatory framework, the significance criteria used to evaluate impacts on identified resources as a consequence of implementing the alternatives, the methods used in evaluating these impacts, and the results of the impact assessment based on the applied significance criteria.

4.14.1 Affected Environment

Regulatory Setting

State

California Scenic Highway Program

In 1963, the California legislature created the Scenic Highway Program to protect scenic highway corridors from changes that would diminish the aesthetic value of lands next to the highways. The state regulations and guidelines governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq. A highway may be designated as “scenic” depending on how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the travelers’ enjoyment of the view.

No state-designated scenic routes are in the project area. Contra Costa County contains two state-designated scenic highways (Interstate 680 and State Route [SR] 24) and Alameda County has Interstate 580. None of these three highways is near or within views of the project components. While Caltrans considers SR 4 within the Contra Costa County as eligible for state scenic highway designation, it has not been so designated (Caltrans, 2005).

Local

Contra Costa County General Plan

The Contra Costa County General Plan (Contra Costa County, 2005) presents goals and policies that are applicable to management and protection of scenic resources. These goals and policies include the following:

- Preservation and enhancement of identified scenic routes (Goal 5-R)
- Preservation of scenic qualities of the San Francisco Bay/Delta estuary system and the Sacramento-San Joaquin River/Delta shoreline (Goal 9-12)
- Conservation and protection of scenic views from scenic routes (Policy 5-37)
- Protection of natural topographic features (Policy 5-43)
- New power lines shall be parallel to existing lines (Policy 9-20) (Contra Costa County, 2005)

The specific goals and policies related to visual/aesthetic resources are presented in Appendix E-2.

No designated (local, state, or federal) scenic vistas occur within the project area. However, as defined by the Contra Costa County General Plan, Section 9.6 Scenic Resources, "Contra Costa County is perceived by many as a desirable place to live and work. A major component in that is the scenic vistas that are available throughout the County…two main resources…are…(1) scenic ridges, hillsides and rock outcroppings; and (2) the San Francisco Bay Delta estuary system." Contra Costa County has designated SR 4 and Vasco Road as scenic highways and expressways; Camino Diablo Road, Walnut Boulevard (to the North entrance of the Los Vaqueros Watershed) and Byron Highway as scenic routes: Old River and Clifton Court Forebay as scenic waterways; and the Black Hills ridgeline southwest of the Los Vaqueros Reservoir as a scenic feature. Additionally, Contra Costa County has many smaller, localized scenic resources such as isolated hilltops, rock outcroppings, mature stands of trees, lakes, reservoirs, and other natural features that, although not designated as scenic resources, should be treated as providing aesthetic opportunities, according to the General Plan.

East County Area Plan – A Portion of the Alameda County General Plan

Alameda County's East County Area Plan (Alameda County, 2002) includes visual/aesthetic resource related policies that include the following:

- Minimizing the alteration of natural topography and vegetation (Policy 116)
- Protecting both individual and large stands of mature, healthy trees (Policy 110)
- Landscaping in both rural and urban areas to enhance the scenic quality of the area to screen undesirable views (Policy 114)
- Where grading is necessary, preserving the natural contours to blend with undisturbed slopes (Policy 117) (East County Area Plan, 2005)

Specific policies are listed in Appendix E-1. Alameda County has not identified or designated any scenic vistas or visually-sensitive ridgelines that are within the project area.

Environmental Setting

The project area for visual/aesthetic resources encompasses the landscapes directly affected by facilities proposed under each of the project alternatives and the surrounding areas that would be within view of the project actions. The visual/aesthetic analysis focuses on travel route views, views within parks, and recreational views.

Definitions Related to Visual/Aesthetic Resources

Visual/aesthetic resources consist of the landforms, vegetation, rock and water features, and cultural modifications that create the visual character and sensitivity of a landscape. A number of factors are documented for the existing visual/aesthetic resources of the project area to help determine the manner in which those resources or characteristic landscapes may be modified by the project. The primary existing visual/aesthetic condition factors considered in this EIS/EIR are defined below and include: Visual Quality, Viewer Types and Volumes, Viewer Exposure, and Visual Sensitivity.

Visual Quality is defined as the overall visual impression or attractiveness of an area as determined by the particular landscape characteristics, including landforms, rock forms, water features, and vegetation patterns. The attributes of variety, vividness, coherence, uniqueness, harmony and pattern contribute to the overall visual quality of an area. For the purposes of this EIS/EIR, visual quality is defined according to three levels:

- Indistinctive, or industrial — defined as generally lacking in natural or cultural visual resource amenities typical of the region
- Representative — defined as visual resources typical or characteristic of the region's natural and/or cultural visual amenities
- Distinctive — defined as visual resources that are unique or exemplary of the region's natural or cultural scenic amenities

Viewer Types and Volumes of use pertain to the types (i.e., public viewers including recreationalist and motorist) and amounts of use (i.e., number of recreational users or motorists) that various land uses receive. Land uses that derive value from the quality of their settings are considered potentially sensitive to changes in visual setting conditions. Land uses within the project area that may be sensitive to change in visual conditions include major transportation systems such as designated scenic highways, designated scenic roads, and designated park, recreation and natural areas.

Viewer Exposure addresses the variables that affect viewing conditions from potentially sensitive areas. Viewer exposure considers the following factors:

- Landscape visibility (the ability to see the landscape)
- Viewing distance (i.e., the proximity of viewers to the project)
- Viewing angle — whether the project would be viewed from above (superior), below (inferior) or from a level (normal) line of sight
- Extent of visibility — whether the line of sight is open and panoramic to the project area or restricted by terrain, vegetation and/or structures
- Duration of view

Visual Sensitivity is the overall measure of an existing landscape's susceptibility to adverse visual changes. This analysis of visual sensitivity is based on the combined factors of visual quality, viewer types and volumes, and visual exposure to the project. Visual sensitivity is reflected according to high, moderate, and low visual sensitivity ranges.

Existing Visual Quality of the Region

The visual character of Eastern Contra Costa County is typified by the undulating hills of grassland typical of the northern San Joaquin Valley, agricultural and rural landscapes, and the Delta. The hills provide a backdrop to the agricultural landscape and the Delta, where open views of distant horizons appear, generally unobstructed by local topography or tall vegetation. The agricultural landscape is dominated by crops (i.e., hay, oats, cherries, walnuts, tomatoes, corn, alfalfa, vineyards, and palm nurseries) and other ancillary facilities including outbuildings, tractors, irrigation, and drainage works.

The Delta, which is near the center of the valley at 25 feet mean sea level (msl), is composed of a network of about 700 miles of waterways and 1,100 miles of levees that protect the islands and tracts, most of which have ground surface elevations near or below sea level. Topography in the valley and Delta is uniformly flat; as a result, human-made features (including poles and lines for electricity and phones, blow-off and air valves for underground water pipelines, residential and agricultural structures, fencing, elevated roadway, bridges, levees, canals, highway and local road signage, and other commercial signage) are visible in both near-field and far-field distances. A distinct part of the area landscape is the wind farms, which include numerous wind turbines, outbuildings, and access roads within the Altamont Hills area.

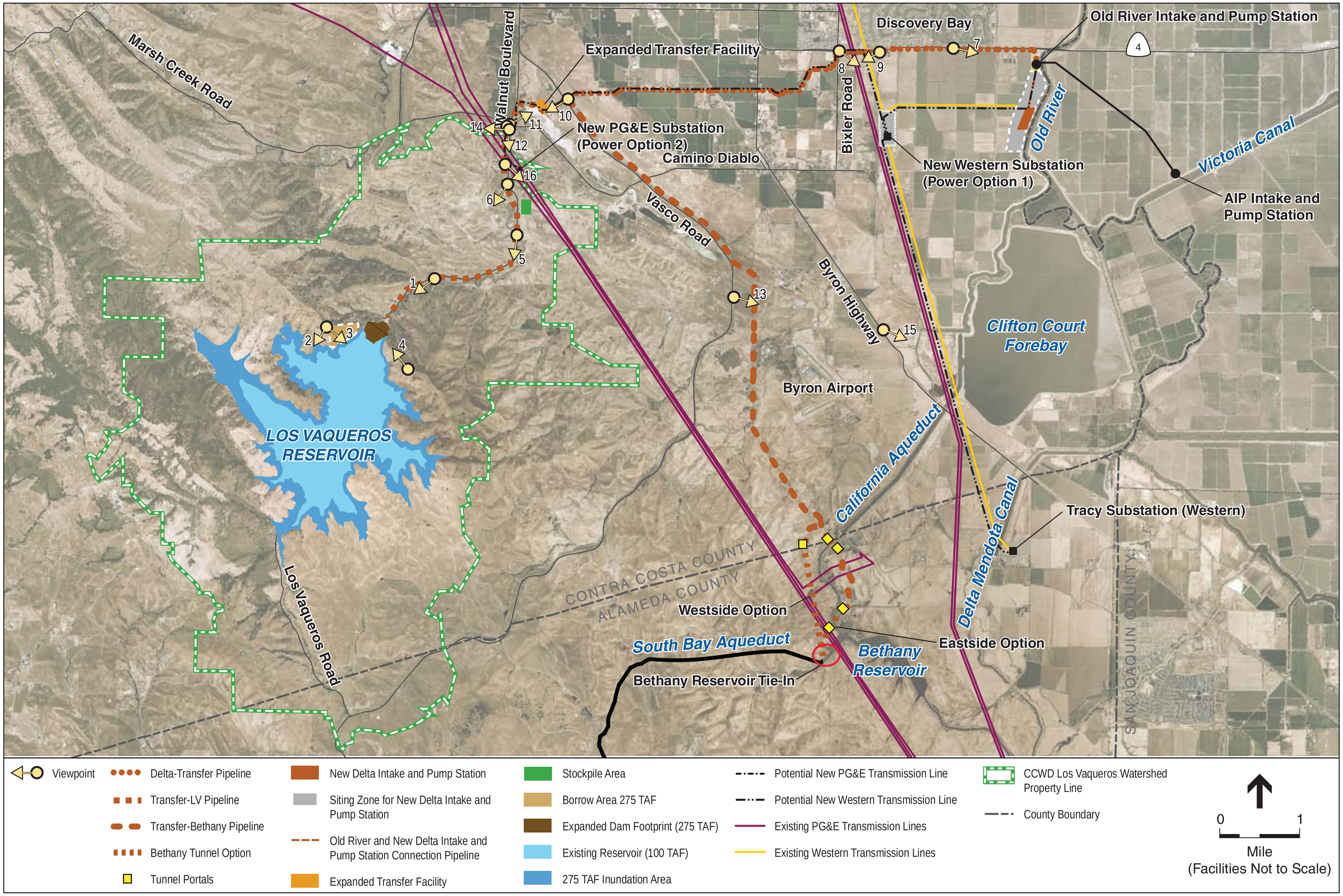
Figure 4.14-1 is a viewpoint map that depicts photograph numbers and provides the location and direction from which photographs were taken. The photographs, presented together as a single group in **Figures 4.14-2** through **4.14-9**, were assigned numbers by order of mention in the following subsections which describe the existing visual character of the project area by component.

Los Vaqueros Reservoir Expansion Area and Recreational Facilities

The Los Vaqueros Reservoir was created by establishing a dam on upper Kellogg Creek (Figure 4.14-2, Photograph 1); the majority of the reservoir is sited within two broad valleys that are about 0.5 mile wide each. The mountainous areas north of the reservoir are predominately grasslands interspersed with oak trees.

The landscape of the Los Vaqueros Watershed (i.e., those lands within the CCWD Los Vaqueros Watershed property line) is characterized by moderate-to-low elevation and northwest-southeast trending ridgelines, and separated by valleys of varying steepness and width. Ridgelines surrounding the reservoir rise to 2,550 feet msl, while the reservoir's high water level is at 472 feet msl.

Views from the Los Vaqueros Reservoir and the areas downstream of the dam are obstructed by ridgelines, which focus views on the natural character of the reservoir and hills. The visual character of the landscape downstream of the dam is a mixture of open grasslands, rolling hills with sparse oak savannah, and scrub habitat. The scenic Black Hills area to the west of the reservoir (Figure 4.14-2, Photograph 2) is characterized by woodland and scrub habitat. To the southeast of the reservoir, the grassland ridges, interspersed with oak woodlands and rock outcroppings, decline in elevation and steepness as they progress toward the San Joaquin Valley (Figure 4.14-3, Photograph 3). To the north, the ridges are grassland ridges interspersed with oak trees; the borrow area for the existing dam has re-vegetated with upland scrub habitat (Figure 4.14-3, Photograph 4).



SOURCE: USGS, 1993 (base map); ESRI, 2006; CCC, 2007; CCWD, 2007; MWH, 2007; and ESA, 2008

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Figure 4.14-1
Viewpoint Map

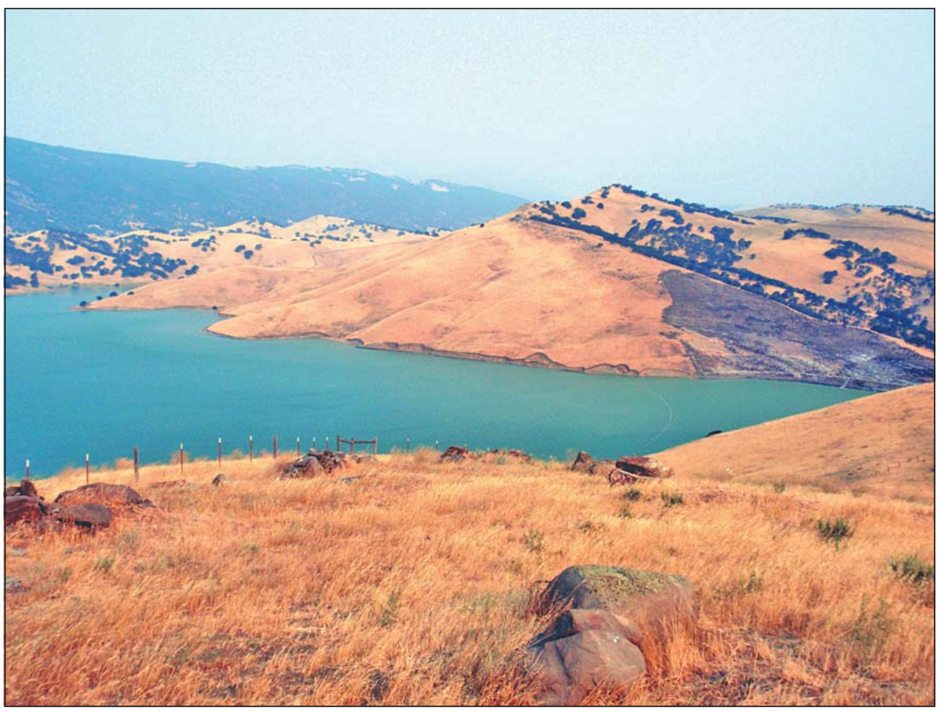
PHOTOGRAPH 1. View from Walnut Boulevard looking southwest at downstream face of the dam. (October 2008)

PHOTOGRAPH 2. View from Vista Grande Trail looking southwest toward the Black Hills (October 2008)

SOURCE: ESA, 2006

Figure 4.14-2
Site Photographs

PHOTOGRAPH 3. View from Vista Grande Trail looking southeast toward San Joaquin County (October 2008)



PHOTOGRAPH 4. View from Eastside Trail looking northwest toward the dam and borrow area (July 2008)

SOURCE: ESA, 2006

Figure 4.14-3
Site Photographs

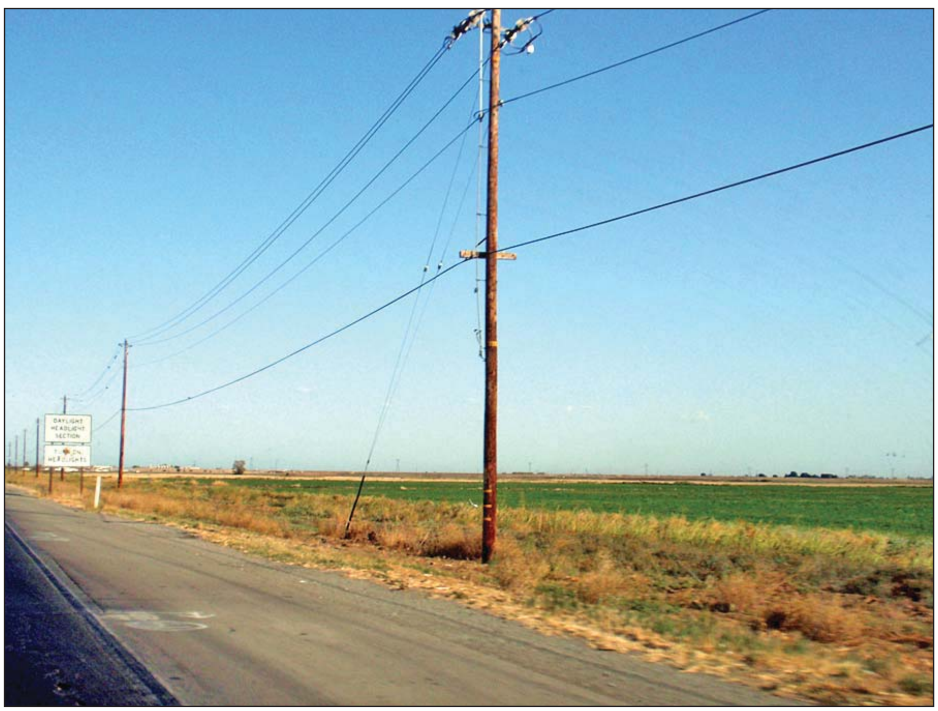
PHOTOGRAPH 5. View from Walnut Boulevard looking south toward the Watershed Office (October 2008)

PHOTOGRAPH 6. View from Walnut Boulevard looking southwest toward 160 TAF Borrow Area (October 2008)

SOURCE: ESA, 2006

Figure 4.14-4
Site Photographs

PHOTOGRAPH 7. View from Highway 4 looking east toward Old River Intake and Pump Station (October 2008)



PHOTOGRAPH 8. View from Highway 4 looking southeast along Delta Transfer pipeline alignment (October 2008)

SOURCE: ESA, 2006

Figure 4.14-5
Site Photographs

PHOTOGRAPH 9. View from Highway 4 looking southwest along Delta Transfer pipeline alignment (October 2008)

PHOTOGRAPH 10. View from Vasco Road looking southwest along Delta Transfer pipeline alignment to Transfer Facility (October 2008)

SOURCE: ESA, 2006

Figure 4.14-6
Site Photographs

PHOTOGRAPH 11. View from Camino Diablo Road looking northeast to backside of Transfer Facility (October 2008)

PHOTOGRAPH 12. View from Camino Diablo Road looking south toward Transfer-LV pipeline alignment (October 2008)

SOURCE: ESA, 2006

Figure 4.14-7
Site Photographs

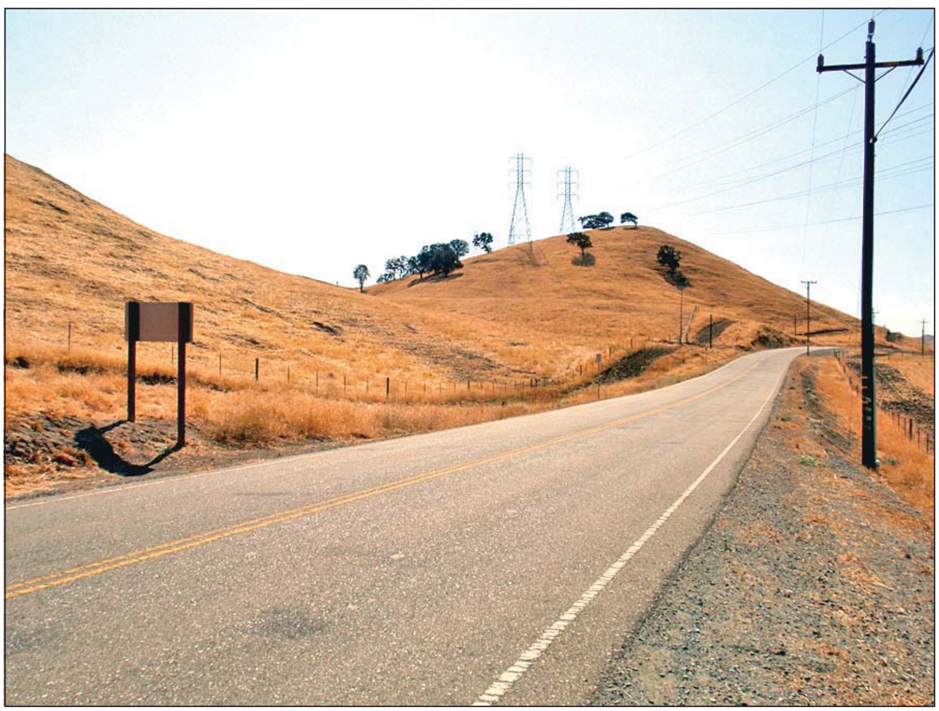
PHOTOGRAPH 13. View from Vasco Road looking southeast toward Transfer-Bethany pipeline alignment (October 2008)

PHOTOGRAPH 14. View from Walnut Boulevard looking west at valve structure of Los Vaqueros pipeline (October 2008)

SOURCE: ESA, 2006

Figure 4.14-8
Site Photographs

PHOTOGRAPH 15. View from Byron Highway looking southeast toward Western potion of Power Option 2: PG&E & Western (October 2008)



PHOTOGRAPH 16. View from Walnut Boulevard looking southeast toward PG&E 69 kV distribution line and substation site associated with Power Option 2: PG&E & Western (October 2008)

SOURCE: ESA, 2006

Figure 4.14-9
Site Photographs

Viewers of the Los Vaqueros Reservoir from the dam looking southward or upstream, including recreational facilities and borrow area, are limited to recreational users of the watershed such as hikers, boaters, and anglers. Views of the reservoir and associated recreation facilities (marina, fishing piers, and adjacent roads / trails) by recreational users on the trail network provided by the Morgan Territory and Round Valley Regional Preserves are generally obstructed by vegetation and topography.

The visual setting downstream of the dam is characterized by grassland hills interspersed with oak trees and the meandering Kellogg Creek and its associated riparian habitat (Figure 4.14-4, Photograph 5). Near the dam, a number of mitigation ponds are interspersed with Kellogg Creek. Utilitarian features dotting the landscape include Walnut Boulevard, power poles and lines, blow-off and air valves associated with the Los Vaqueros Pipeline, lattice transmission structures, wind generation facilities, fences, recreational trails, parking, picnic areas, the Interpretive Center, and other District facilities (i.e., Watershed Office and other support buildings). Additionally, as some of the lands surrounding the reservoir are used for livestock grazing, sheep, cows, and goats are often part of the visual landscape.

Viewers of the dam from downstream are generally limited to recreational users traveling via Walnut Boulevard to the Interpretive Center and to the area adjacent to the top of the dam. Views of the dam core borrow area for the 160-thousand acre feet (TAF) reservoir (160-TAF borrow zone) would generally be screened by the Kellogg Creek riparian vegetation (Figure 4.14-4, Photograph 6) but would be visible from hikers on portions of the Alkali Meadow Trail.

In summary, the visual quality of the watershed is considered distinctive because the natural foothills landscape has been largely preserved and unaltered.

Delta Intake Facilities

The visual character of the landscape surrounding the Old River Intake and Pump Station as well as the new Delta Intake and Pump Station is predominately agricultural. Views of Old River from the west are generally obstructed by the levee systems, and views from the east are generally limited to the SR 4 bridge across Old River.

Two “industrial-type” facilities already exist within the area: (1) CCWD’s Old River Intake and Pump Station (see Figure 4.14-5, Photograph 7) is characterized as industrial in nature featuring buildings, fencing, power poles and lines, pipelines and intake facilities; and (2) the Town of Discovery Bay’s Community Services District Wastewater Treatment Plant, consisting of buildings, fencing and three lagoons.

Viewers of the Old River Intake and Pump Station as well as the new Delta Intake and Pump Station would generally be limited to motorists on SR4, recreational users of Old River (generally used as a travel corridor to and from the south Delta), and one residence on the southeast side of Old River on Victoria Island. The visual quality of the area is representative of the largely agricultural areas next to the Delta.

Delta-Transfer Pipeline Area

The visual character of the landscape surrounding the Delta-Transfer pipeline area is agricultural, composed of crops (i.e., hay, oats, cherries, walnuts, tomatoes, corn, alfalfa, vineyards and palm nurseries), homes/farms and associated out buildings and infrastructure including farm roads (Figure 4.14-5 Photograph 8), three transmission lines with large steel lattice towers (Figure 4.14-6 Photograph 9), power poles and lines, and aboveground blow-off and air valves associated with the Old River Pipeline. Public viewers of the Delta-Transfer Pipeline area would generally be limited to motorist on SR 4 between Discovery Bay and Byron Highway, and Vasco Road near the Transfer Facility. Other local roads which would afford views of the area would be Bixler Road, Kellogg Creek Road, and Hoffman Lane. The visual quality of the area is representative of the agricultural area next to the Delta and throughout the southeastern county area.

Transfer Facility Expansion

The visual character of the landscape surrounding the existing Transfer Facility is generally open space characterized by rolling grassland hills (Figure 4.14-6 Photograph 10). To the west, the landscape is scarred, characterized by the surface mining activities taking place at Unimin's Byron Sand Plant Quarry (Figure 4.14-7 Photograph 11). Views of the Transfer Facility are available from Vasco Road, Walnut Boulevard, and Camino Diablo Road. However, views from Vasco Road are generally limited because the surrounding topography provides screening. The visual quality of the area from Walnut Boulevard and Camino Diablo Road is indistinct due to the mining operations. From Vasco Road, the visual quality is representative of the rolling grassland hills in the valley.

Transfer-LV Pipeline

The visual character of the landscape of the Transfer-LV Pipeline alignment near the Transfer Facility is scarred due to surface mining activities taking place at Unimin's Byron Sand Plant Quarry. As the pipeline alignment enters the watershed, the landscape is characterized by rolling grassland hills dotted with trees and evidence of mining activities (Figure 4.14-7 Photograph 12). Views within the watershed specific to the area downstream of the dam are described above under Los Vaqueros Reservoir Expansion Area and Recreational Facilities. Generally, the visual quality of the area is distinctive because the natural foothills landscape has been largely preserved and unaltered.

Inlet/Outlet Pipelines

These pipelines are associated with the dam and would extend from the dam downstream to connect with the Transfer-LV Pipeline. Descriptions of the visual character and likely viewers of the inlet/outlet pipelines area are provided above under the discussion Los Vaqueros Reservoir Expansion Area and Recreational Facilities. The visual quality of the area is distinctive because the natural foothills landscape has been largely preserved and unaltered.

Transfer-Bethany Pipeline

The visual character of the landscape around this pipeline alignment from the Transfer Facility along Vasco Road to Armstrong Road is generally rolling grassland hills (Figure 4.14-8 Photograph 13). The area along Armstrong Road is rural residential, and is characterized by small ranches, the Brushy Creek riparian corridor, utility poles/wires and the Byron Municipal Airport. South of Armstrong Road the area is again characterized by rolling grassland hills with occasional riparian zones along the local drainages. As the alignment approaches the California Aqueduct, the visual landscape contains more man-made features including wind generation facilities and associated buildings accessed via Byron Hot Springs Road, transmission lines and lattice towers, the California Aqueduct, Bethany Reservoir, and the South Bay Aqueduct and Pump Station.

Viewers of the Transfer-Bethany pipeline area would generally be limited to motorists traveling on Vasco Road, Armstrong Road, and Byron Hot Springs Road. Views south of Byron Hot Springs Road would not be accessible to the public as the area is secure and requires a key. There would be no public views of the project area from within the Bethany Reservoir State Recreation Area, because the southwestern area of the Bethany Reservoir is not open to the public. The visual quality of the area is representative of the rolling grassland hills in the valley interspersed with ranches and associated farming facilities.

Blow-off and Air Valves

Blow-off and air valves would be associated with the Delta-Transfer, Transfer-LV, and Transfer Bethany pipeline alignments. Blow-off and air valves are already elements of the visual landscape for the Delta-Transfer, and Transfer-LV pipeline areas. Figure 4.14-8 Photograph 14 shows a valve structure near the intersection of Walnut Boulevard and Camino Diablo Road.

Power Option 1: Western Only

The visual character of the landscape around the facilities to be constructed under Power Option 1 is generally the same as described in the preceding Delta intake facilities and Delta-Transfer Pipeline subsections. The area is dominated by agricultural lands crisscrossed with large lattice towers and transmission lines. Therefore, views generally encompass a rural, agricultural landscape characterized by crops (i.e., hay, oats, cherries, walnuts, tomatoes, corn, alfalfa, vineyards, and palm nurseries), homes/farms and associated out buildings and infrastructure including farm roads and distribution and transmission lines. Views of the proposed substation and distribution line would generally be limited to the stretch of SR 4 from Discovery Bay to Bixler Road. Local roads affording views include Kellogg Creek Road, Camino Diablo Road and Hoffman Lane; as well as at the crossing of Vasco Road. The visual quality of the area is representative of the agricultural areas next to the Delta and throughout the southeastern county area.

Power Option 2: Western & PG&E

The visual character of the landscape around the Western portion of the facilities to be constructed under Power Option 2 is generally agricultural. The view generally encompasses a rural, agricultural landscape characterized by crops, homes/farms and associated out buildings. The visual landscape is also interspersed with man-made features including two 500-Kilovolt (kV) and one 230-kV transmission lines that parallel the proposed transmission line alignment south to north (Figure 4.14-9 Photograph 15), Tracy Substation, the Delta Mendota Canal, California Aqueduct, Old River Intake and Pump Station, farm roads and other utility lines.

Views of the proposed transmission line would generally be limited to local roadways generally north of Kelso Road, east of Byron Highway, west of Clifton Court and Old River and south of SR 4 including: Kelso Road, Mountain House Road, Bethany Lane, Herdlyn Road, Bruns Road, Byron Highway, Clifton Court Road, and Western Farms Ranch Road. Views of the transmission line may be available to recreational users of Italian Slough (i.e., anglers); however, due to the levees in the vicinity of the Old River Intake and Pump Station, views from Old River would be obscured. The visual quality of the area is representative of the agricultural area next to the Delta and throughout the southeastern county area.

The visual character of the landscape around the Pacific Gas and Electric (PG&E) portion of Power Option 2 near the Transfer Facility is scarred due to surface mining activities taking place at Unimin's Byron Sand Plant Quarry (See Figure 4.14-7 Photograph 12). Additionally, there are homes along Longwell Road where the alignment traverses before entering the watershed. Within the watershed, the landscape is characterized by rolling grassland hills dotted with trees and intermittent views of Kellogg Creek. Utility lines extend along the roadways and a 500kv PG&E transmission line on lattice towers crosses the area. The proposed substation would be in an area surrounded by steeper topography, limiting views from Walnut Boulevard and one residence on the western hilltop (Figure 4.14-9 Photograph 16). Although evidence of surface mining is apparent, in general, the visual quality of the area is representative.

Contra Costa County has designated SR 4 and Vasco Road as scenic highways and expressways; Camino Diablo Road, Walnut Boulevard (to the entrance of the watershed) and Byron Highway as scenic routes, Old River and Clifton Court Forebay as scenic waterways; and the Black Hills ridgeline southwest of the Los Vaqueros Reservoir as a scenic feature.

Viewer Types and Exposures

Viewer types and exposure conditions vary substantially in the project area. Public viewer groups evaluated include: motorists along SR 4 (a state eligible scenic highway and county-designated scenic highway/expressway); Vasco Road (county-designated scenic highway/expressway); Camino Diablo Road, Walnut Boulevard (to the entrance of the watershed), Byron Highway (county-designated scenic routes) and Los Vaqueros Road; and visitors to recreational areas including the watershed and Old River (county-designated scenic waterway).

For each of the viewer groups identified in the project area, viewer exposure conditions were determined based on knowledge of the project areas and a site visit conducted on October 10, 2008. Variables considered include the viewing distance, angle of view, the extent to which views are screened or open, and duration of view. Viewing distances are described according to whether the project activities would be viewed within a foreground (within 0.5 mile or 2,640 feet), middleground (0.5 to 2.0 miles), or background (beyond 2.0 miles) zone. Viewing angle and extent of visibility considers the relative location of the project facility to the viewer and whether visibility conditions are open or panoramic, or limited by intervening vegetation, structures or terrain.

Duration of view pertains to the amount of time the project facilities or area would typically be seen from a sensitive viewpoint. In general, duration of view would be less in instances where the project facility would be seen for short or intermittent periods (such as from major travel routes and recreation destination roads) and greater in instances where the project facility would be seen regularly and repeatedly (such as from public use areas).

Motorists on Major or Scenic Travel Routes

Scenic highways and routes within the project area include SR 4, Byron Highway, Vasco Road, Camino Diablo, and Walnut Boulevard. In addition, Los Vaqueros Road is considered to be a major travel route to and from the southern portion of the reservoir. Views along SR 4, Byron Highway and Los Vaqueros Road (near the reservoir) are generally panoramic and open, while views along Vasco Road, Camino Diablo Road, and Walnut Boulevard are generally limited by the surrounding hilly terrain.

The Old River Intake and Pump Station and about 2.5 miles of the Delta-Transfer Pipeline alignment would be within the foreground view from SR4. The new Delta Intake and Pump Station as well as the Western facilities associated with Power Option 1 and Power Option 2 would be in the middleground. Traffic volumes on SR4 are high and views are generally panoramic and open but of short duration.

The Western facilities associated with Power Option 1 and Power Option 2 would generally be within background views along Byron Highway, with the exception of two areas where the transmission line would cross the highway. Traffic volumes are relatively high and views are generally panoramic and open but of short duration.

Portions of the Delta-Transfer Pipeline and Transfer-Bethany Pipeline would be within the foreground views along Vasco Road. Views of the Transfer Facility Expansion would be obscured due to the topography of the area. Traffic volumes are relatively high, and views are generally limited by the hilly terrain and of short duration.

The Transfer-Bethany Pipeline and Transfer-LV Pipeline would be within the foreground view of Camino Diablo Road at two locations where these pipeline alignments would cross the road. Traffic volumes are moderate and views are generally limited by the hilly terrain and of short duration. Views of the Transfer Facility from this road are obscured by the hilly terrain.

The Transfer-LV Pipeline, Power Option 2 PG&E transmission line, inlet/outlet pipelines, and dam modification would be within the foreground view from Walnut Boulevard. Traffic volumes are moderate and views are generally limited by the hilly terrain and of short duration.

The expanded Los Vaqueros Reservoir, dam modification, shell borrow area, and recreational facilities on the southern shore would be within the foreground view of Los Vaqueros Road. Traffic volumes are low and views are generally panoramic and open at the reservoir.

Park and Recreation Areas

Parks and recreational areas in the project area include the Los Vaqueros Watershed, Round Valley Regional Preserve, Morgan Territory Regional Preserve, and Old River.

The expanded Los Vaqueros Reservoir, dam modification, shell borrow area and recreational facilities would be visible to recreation users in the watershed. Recreational use is relatively low within the watershed. Boaters and anglers generally enjoy panoramic and open views of the reservoir and associated recreational facilities. Hikers' views can range from open and panoramic to obstructed by vegetation and terrain, depending where the recreational users are in the watershed. Viewer exposure is considered moderate due to the low number of views, high view duration and open visibility.

The expanded Los Vaqueros Reservoir would not be visible to hikers using trails that traverse the Round Valley Regional Preserve and Morgan Territory Regional Preserve and connect to the watershed. Recreational use is relatively low where these trails connect with the Los Vaqueros trail system. Views of the reservoir area are limited by the vegetation and hilly terrain.

The intake structure associated with the new Delta Intake and Pump Station would be visible to recreational users on Old River. Recreational use within the vicinity of the Delta intake facilities is relatively low, as this area of the river is used primarily to traverse from Discovery Bay to other parts of the southern Delta; no marina or other recreation facilities exist along this stretch of Old River. However, views of the other facilities at the proposed intake and pump station would generally be obstructed by the levees. Viewer exposure is considered low due to the low number of views, low view duration, and limited visibility.

Visual Sensitivity

Visual sensitivity is a composite measurement of the overall susceptibility of an area or viewer group to adverse visual or aesthetic impacts, given the combined factors of landscape visual quality, viewer types, and exposure conditions. **Table 4.14-1** summarizes the visual sensitivity of the major viewer types that would be affected by the project facilities.

4.14.2 Environmental Consequences

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. These thresholds also encompass the factors taken into account under the National Environmental Policy Act (NEPA) to determine the significance of an action in terms of its context and the intensity of its effects. An alternative was determined to result in a significant effect on visual/aesthetic resources if it would do any of the following:

- Have a substantial, demonstrable negative aesthetic effect on a scenic vista
- Substantially damage scenic resources including, but not limited to, scenic waterways, trees, rock outcroppings, and historic buildings within a state scenic highway
- Substantially degrade the existing visual character or quality of the site and its surroundings
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area

TABLE 4.14-1
SUMMARY OF VISUAL SENSITIVITY FINDINGS
VIEWER TYPES, VISUAL EXPOSURES, AND VISUAL QUALITY

Viewer Type	Visual Quality	Viewer Exposure and Volumes	Visual Sensitivity	Project Component
Travel Routes				
SR 4	Representative	Foreground Distance Unobstructed Views High Number of Viewers Low View Duration	Moderate	Delta Intake Facilities Delta-Transfer Pipeline Western Power Facilities
Byron Highway	Representative	Background Distance (except two crossings) Unobstructed Views High Number of Viewers Low View Duration	Low	Western Power Facilities
Vasco Road	Representative	Foreground Distance Unobstructed Views High Number of Viewers Low View Duration	Low	Delta-Transfer Pipeline Transfer-Bethany Pipeline
Camino Diablo	Representative	Foreground Distance Obstructed Views Moderate Number of Viewers Low View Duration	Low	Transfer-LV Pipeline Transfer-Bethany Pipeline
Walnut Boulevard	Distinct	Foreground Distance Obstructed Views Low Number of Viewers Low View Duration	Low	Dam Modification Transfer-LV Pipeline Inlet/Outlet Pipelines PG&E Transmission Line 160 TAF Borrow Area
Los Vaqueros Road	Distinct	Foreground Distance Unobstructed Views Low Number of Viewers High View Duration	Moderate	Los Vaqueros Reservoir Expansion Dam Modification Shell Borrow Area Recreational Facilities
Park/Recreation				
Los Vaqueros Watershed	Distinct	Fore, Middle and Background Distances Obstructed/unobstructed Views Low Number of Viewers High View Duration	Moderate to High	Los Vaqueros Reservoir Expansion Dam Modification Shell Borrow Area Recreational Facilities
Old River	Representative	Foreground Distance Partially obstructed Views Low Number of Viewers Low View Duration	Low	New Delta Intake and Pump Station

Because no state-designated scenic highways run near or through the project area, no potential exists for project impacts related to substantially damaging scenic resources within a state scenic highway. As such, impacts to scenic resources within a state scenic highway are not discussed below.

Definition and Use of Significance Criteria

An adverse impact to visual/aesthetic resources may occur when: (1) an action perceptibly changes the existing physical features of the landscape that are characteristic of the region or locale; (2) an action introduces new features to the physical landscape that are perceptibly uncharacteristic of the region or locale, or become visually dominant in the viewshed; or (3) an action blocks or totally obscures aesthetic features of the landscape. The degree of visual impact depends on how noticeable the adverse change is. The noticeability of a visual impact is a function of the project features, context, and viewing conditions (angle of view, distance, and primary viewing directions). The key factors in determining the degree of visual change are visual contrast, project dominance, and view blockage.

Visual Contrast

Visual contrast is a measure of the degree of change in line, form, color, and texture that the project will create, when compared to the existing landscape. Visual contrast ranges from none to strong, and is defined as:

- *None* – The element contrast is not visible or perceived
- *Weak* – The element contrast can be seen but does not attract attention
- *Moderate* – The element contrast begins to attract attention and begins to dominate the characteristic landscape
- *Strong* – The element contrast demands the viewer's attention and cannot be overlooked

Project Dominance

Visual dominance is a measure of a project feature's apparent size relative to other visible landscape features in the viewshed, or seen area. A feature's dominance is affected by its relative location in the viewshed and the distance between the viewer and feature. The level of dominance can range from subordinate to dominant.

View Blockage or Impairment

View blockage or impairment is a measure of the degree to which project features would obstruct or block views to aesthetic features due to the project's position and/or scale. Blockage of aesthetic landscape features or views can cause adverse impacts, particularly in instances where scenic or view orientations are important to the use, value or function of the land use.

Overall Adverse Visual Impact

Overall adverse impacts to visual/aesthetic resources reflect the composite visual changes to both the directly affected landscape and from sensitive viewing locations. The visual impact levels referenced in this EIS/EIR indicate the relative degree of overall change to the visual environment that the project alternatives would create, considering visual sensitivity, visual contrast, view blockage, and project dominance.

In general, the determination of impact significance is based on combined factors of Visual Sensitivity and the Degree of Visual Change that the project would cause. The inter-relationship of these two overall factors in determining whether adverse visual impacts are significant is shown in **Table 4.14-2**.

TABLE 4.14-2
GUIDELINES FOR DETERMINING ADVERSE VISUAL IMPACT SIGNIFICANCE

	Overall Visual Change				
Overall Visual Sensitivity	**Low**	**Low to Moderate**	**Moderate**	**Moderate to High**	**High**
Low	Not Significant	Not Significant	Adverse, but Not Significant	Adverse, but Not Significant	Adverse, but Not Significant
Low to Moderate	Not Significant	Adverse, but Not Significant	Adverse, but Not Significant	Adverse, but Not Significant	Adverse, but Not Significant
Moderate	Adverse, but Not Significant	Adverse, but Not Significant	Adverse, but Not Significant	Adverse and Potentially Significant	Adverse and Potentially Significant
Moderate to High	Adverse, but Not Significant	Adverse, but Not Significant	Adverse and Potentially Significant	Adverse and Potentially Significant	Significant
High	Adverse, but Not Significant	Adverse and Potentially Significant	Adverse and Potentially Significant	Significant	Significant

Not Significant impacts may or may not be perceptible but are considered minor in the context of existing landscape characteristics and view opportunity.

Adverse, but Not Significant Impacts are perceived as negative but do not exceed environmental thresholds.

Adverse and Potentially Significant Impacts are perceived as negative and may exceed environmental thresholds depending on project- and site-specific circumstances.

Significant impacts with feasible mitigation may be reduced to less-than-significant levels or avoided all together. Without mitigation or avoidance measures, significant impacts would exceed environmental thresholds.

Impact Summary

Table 4.14-3 provides a summary of the impact analysis for issues related to visual/aesthetic resources.

TABLE 4.14-3
SUMMARY OF IMPACTS – VISUAL/AESTHETIC RESOURCES

Impact	Project Alternatives			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.14.1: The project alternatives would not have a substantial, demonstrable negative aesthetic effect on a scenic vista or from a county-designated scenic highway or route.	LS	LS	LS	LS
4.14.2: The project alternatives would not substantially degrade the existing visual character or quality of the site and its surroundings, except Alternative 4 due to the borrow area in Kellogg Valley.	LS	LS	LS	LSM
4.14.3: The project alternatives would not create a new source of substantial light but Alternatives 1, 2, and 3 could create a new source of substantial glare that could adversely affect views in the area.	LSM	LSM	LSM	LS
4.14.4: The project alternatives would not make a cumulatively considerable contribution to adverse effects on visual/aesthetic resources in the project area or broader region.	LS	LS	LS	LS

NOTES:
SU = Significant and Unavoidable
LSM= Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed, and existing facilities would not be altered, expanded, or demolished. Implementation of this alternative would not affect scenic vistas, scenic resources, or the existing visual character of the surrounding area, and would not create any additional source of light or glare.

Impact 4.14.1: The project alternatives would not have a substantial, demonstrable negative aesthetic effect on a scenic vista or from a county-designated scenic highway or route. (Less than Significant)

Contra Costa General Plan states that a major component to the perception that Contra Costa County is a desirable place to live and work is the scenic vistas that are available through out the County. Noting that the County has many localized features, the General Plan, 9.6 Scenic Resources focuses on two main resources (1) scenic ridges, hillsides, and rock outcroppings; and (2) the San Francisco Bay/Delta estuary system. Therefore, for purposes of this CEQA analysis, “scenic vista” encompasses scenic resources as designated by the Contra Costa County General Plan.

Within the project area, Contra Costa County has designated the Black Hills ridgeline southwest of the Los Vaqueros Reservoir as a scenic ridgeline; SR 4 and Vasco Road as scenic highways and expressways; Camino Diablo Road, Walnut Boulevard (to the entrance of the watershed) and Byron Highway as scenic routes; and Old River and Clifton Court Forebay as scenic waterways. In addition to evaluating effects on scenic vistas and views of scenic resources, this section evaluates views from scenic highways and routes.

Alternative 1

Los Vaqueros Reservoir Expansion

Reservoir expansion would result in an increase in the inundation area of the reservoir and some recreational facilities (i.e., marina, boats, and docks) that are currently on the southern shore would be moved to the northern shore near the dam. Currently, the reservoir high-water level is about 472 feet msl and with inundation it would rise to a height of 560 feet msl. Although this increase in inundation would be perceptible to anglers, boaters and hikers on trails within the watershed, it would result in a weak visual contrast. Further, this change would not dominate the views of the Black Hills Ridgeline, a county designated scenic ridgeline about 1 to 5 miles southwest of the Los Vaqueros Reservoir, and would not obstruct views of the Black Hills Ridgeline.

Moreover, removal of some recreational facilities on the south end would decrease the number of man-made features within the view of the Black Hills Ridgeline. Therefore, the relative change in the views of the Black Hills Ridgeline as viewed by recreational users of the Los Vaqueros Reservoir would be low.

New Delta Intake and Pump Station

The views from SR 4, a county designated scenic highway, of the new Delta Intake and Pump Station are generally agricultural and industrial in the foreground. Middle and background views are obscured by the levee systems along Old River, a county designated scenic waterway. For instance, when driving west on Highway 4, views of Old River are within the foreground, but views of the Old River Intake and Pump Station and the new Delta Intake and Pump Station site would be obstructed by the natural bend in Old River and the levees. When driving east on Highway 4, views of Old River are completely obscured by the levee system. Views of the new intake would be within the foreground of recreational users of Old River as they travel from Discovery Bay to the south Delta.

Views from Old River are also generally obscured by levees. However, similar to the existing Old River Intake and Pump Station, many new structures associated with the new Delta Intake and Pump Station would be placed inside a ring levee, which surrounds the site and creates a visual barrier of the site.

Since the new structures would be similar to those already existing at the Old River Intake and Pump Station, the visual contrast would be weak, would not cause a substantial visual contrast to existing views, and would not dominate nor obstruct the view. Therefore, the relative change in the views from SR4 would be low.

Delta-Transfer Pipeline

Permanent structures associated with the Delta-Transfer Pipeline would include blow-off valves and air valves that extend about 2 feet above the ground (See Figure 4.14-8, Photograph 14). Blow-off and air valves associated with the Old River Pipeline already appear along SR4. Blow-off and air valves associated with the Delta-Transfer Pipeline would be installed about every 2,000 and 1,000 feet, respectively.

Although drivers along SR4 could see these structures in the foreground views, because the blow-off valves and air valves structures would be similar to existing structures, the visual contrast would be weak. Additionally, as some blow-off valve structures would be in low-lying areas and some would be screened by intermittent vegetation along SR4, the introduction of these new structures would not cause a substantial visual contrast to existing views and would not dominate or obstruct the views from SR4. Therefore, the relative change in the views from SR4, a county designated scenic route, would be low.

Transfer Facility Expansion

Views of permanent structures associated with the Transfer Facility Expansion would be obstructed from viewers traveling along Vasco Road, a county-designated scenic highway, by the existing topography around the site. Thus, there would no change in view from this road and no scenic vista would be obstructed.

Transfer-LV Pipeline

Permanent structures associated with the Transfer-LV Pipeline would include blow-off valves and air valves. Blow-off and air valves associated with the Los Vaqueros Pipeline already appear along Walnut Boulevard. Although drivers along Walnut Boulevard would see these structures in foreground views, because these structures would be similar to existing structures, the visual contrast would be weak. Moreover, as some blow-off valve structures would be in low-lying areas and some would be screened by the intermittent vegetation and topography along Walnut Boulevard, the introduction of these new structures would not cause a substantial visual contrast to existing views and would not dominate or obstruct the views from Walnut Boulevard. Therefore, the relative change in the views from Walnut Boulevard, a county designated scenic route, would be low.

Inlet/Outlet Pipelines

Permanent structures associated with the inlet/outlet pipelines would not obstruct views of any scenic vistas.

Transfer-Bethany Pipeline

Like the Delta-Transfer Pipeline, the only aboveground structures associated with the Transfer-Bethany Pipeline would include blow-off valves and air valves that stand about 2 feet aboveground. Drivers from Vasco Road, a county-designated scenic highway/expressway, could see these valves in the foreground. However, some of these blow-off valves would be placed in low-lying areas along the pipeline alignment and would generally be obscured by the natural topography. Regarding air valves that may be placed at a higher elevation, these structures are generally small and would blend in with other structures in the viewshed including, but not limited to wire and wood post fencing, small lattice wind mills and associated ranching equipment. Therefore, the introduction of these new structures would not cause a substantial visual contrast to existing views and would not dominate or obstruct the views from Vasco Road. Accordingly, the relative change in the views from Vasco Road would be low.

Power Infrastructure

Power Option 1: Western Only. A new substation, access road to the facility and 69 kV transmission line to the new Delta Intake and Pump Station would be constructed about 2,500 feet south of SR4 and 1 to 1.5 miles east of Byron Highway. The substation and access road would be constructed next to three large existing transmission lines installed on lattice towers.

Views of the substation site are generally obstructed by existing vegetation and development from SR4 and Byron Highway, respectively. Moreover, the substation would be fenced and a landscaping plan to add visual screening would be implemented. Therefore, the new substation and access road would not cause a substantial visual contrast to existing views and would not dominate or obstruct the views from SR4 or Byron Highway. Accordingly, the relative change in the views from SR4 or Byron Highway would be low.

For the portion of the transmission line from the substation east to the new Delta Intake and Pump Station and west to the Transfer Facility wooden poles and conductors already exist within most of the proposed alignment. Therefore, installation of a new transmission line or replacement of the existing transmission line would not result in a substantial visual contrast since the new poles and conductors would be similar to those that currently exist. Moreover, the transmission facilities would not dominate or obstruct views from SR4 or at the Byron Highway and Vasco Road crossings. Accordingly, the relative change in the views from SR4, Byron Highway, and Vasco Road would be low.

Power Option 2: PG&E and Western. Western's new wooden power poles and transmission line from the Tracy Substation to the new Delta Intake and Pump Station would be visible from Byron Highway. Views from SR 4 for the portion of the transmission line that would be in the same alignment as proposed under Power Option 1 were discussed previously.

In general, the views of the alignment vary from foreground to background views depending on one's location on Byron Highway. However, these new, approximately 50-foot poles would be within an existing transmission line corridor that contains three transmission lines: two 500 kV lines and one 230 kV line on lattice towers. Therefore, installation of a new transmission line would not result in a substantial visual contrast because the new poles and conductors would be substantially smaller than the existing facilities. Moreover, views of the facilities would be intermittently obstructed by topography and man-made features including farm buildings and houses.

The new transmission line would not dominate or obstruct views from Byron Highway. Therefore, the relative change in the views from SR 4 and Byron Highway would be low.

A portion of the PG&E transmission line would be visible in foreground views from Walnut Boulevard and at the crossing of Camino Diablo Road. Because existing wooden poles and conductors already line these local roadways, installation of a new transmission line would not result in a substantial visual contrast because the new poles and conductors would be similar to what currently exist. The proposed substation would be in an area surrounded by steeper topography, limiting views from Walnut Boulevard. Therefore, the transmission facilities would not dominate or obstruct views from Walnut Boulevard or Camino Diablo Road. Accordingly, the relative change in the views from Walnut Boulevard and Camino Diablo Road would be low.

Summary

In all cases, construction of proposed facilities under Alternative 1 would not dominate or obstruct views of scenic vistas from any of the county-designated scenic resources including highways, expressways, routes, or waterways. Therefore, the project effect on scenic vistas would be less than significant.

Alternative 2

Impacts related to scenic vistas resulting from implementation of Alternative 2 would be the same as analyzed under Alternative 1 because Alternative 2 includes implementation of the same facilities as does Alternative 1. Therefore, impacts to scenic vistas would be less than significant.

Alternative 3

Impacts related to scenic vistas from implementation of Alternative 3 would be less than Alternative 1 because the Transfer-Bethany Pipeline would not be constructed, thereby reducing visual impacts to viewers along Vasco Road, a county designated scenic highway. Moreover, Alternative 3 would not include construction of the new Delta Intake and Pump Station.

Construction activities at the existing Old River Intake and Pump Station would take place inside the fenced property and ring levee, which surrounds the site and creates a visual barrier of the site, therefore limiting impacts to viewers along SR4 and recreational users of Old River. Installation of a new fish screen within an existing bay, next to an existing screen, would not result in a substantial visual contrast to existing views from Old River. Moreover, the new screen would not dominate or obstruct views from Old River. Accordingly, the relative change in the views from SR4 and Old River would be low, and overall impacts to scenic vistas would be less than significant.

Alternative 4

Impacts to scenic vistas resulting from implementation of Alternative 4 would be less than Alternative 1 because this alternative involves a smaller reservoir expansion (160 TAF) and most of the project components associated with Alternative 1 would not be implemented under this alternative. The following components would not be constructed: Delta Intake and Pump Station, Delta-Transfer Pipeline, Transfer Facility Expansion, Transfer-LV Pipeline, Transfer-Bethany Pipeline, Power Supply Option 1 or 2, or the Marina Complex on the northern shoreline.

Recreation facilities would be relocated or constructed in different locations compared to Alternative 1; for example, the Westside Access Road would be lower in elevation than proposed under Alternative 1 and recreational facilities including the Marina would generally be constructed upslope of the existing facilities under Alternative 4 rather than in new locations as under Alternative 1. No impacts to scenic vistas would result from the 160-TAF borrow area as it is not within the viewshed of any scenic vistas. The following paragraphs discuss impacts resulting from the expansion of Los Vaqueros Reservoir, Westside Access Road and relocated recreational facilities associated with Alternative 4.

Reservoir expansion to 160 TAF would result in an increase in the inundation area of the reservoir and some recreational facilities (i.e., marina, boats, docks, and western hiking trail/access road) that are currently on the southern shore would be moved upslope. Currently, the reservoir high water level is about 472 feet msl and with inundation it would rise to a height of 510 feet msl.

Although this increase in inundation and relocated recreational facilities (i.e., marina, boat docks, picnic area, Westside Access Road, etc.) would be perceptible to anglers, boaters and hikers within the watershed, the changes would result in a weak visual contrast. These changes would not dominate the views of the Black Hills Ridgeline, a county-designated scenic ridgeline about 1 to 5 miles southwest of the Los Vaqueros Reservoir, and would not obstruct views of the Black Hills Ridgeline. Therefore, the relative change in the views of the Black Hills Ridgeline as viewed by recreational users of the Los Vaqueros Reservoir would be low.

Therefore, the effect on scenic vistas under Alternative 4 would be less than significant.

Mitigation: None required.

Impact 4.14.2: The project alternatives would not substantially degrade the existing visual character or quality of the site and its surroundings, except Alternative 4 due to the borrow area in Kellogg Valley. (Less than Significant for Alternatives 1, 2, and 3; Less than Significant with mitigation for Alternative 4)

Alternative 1

Construction

During the 3-year construction period associated with construction of the 275-TAF reservoir, the Los Vaqueros Watershed would be closed to public access[1]. However, during the 1-year period before the start of construction activities when the reservoir would be drawn down, the public would have access. Because the reservoir area is not visible from trails associated with Morgan Territory and Round Valley Regional Preserves, construction-related impacts that could degrade the existing visual character or quality of the site and its surroundings would not be visible to the

1 The Miwok Trail, to maintain connectivity between Round Valley and Morgan Territory Regional Preserves, would remain open; however, this trail offers no views of the Los Vaqueros Reservoir. See Figure 4.15-2.

public or recreational users. Moreover, increased visibility of the lands beneath the water as the reservoir is drawn down would be temporary in nature.

Outside the watershed, construction equipment, excavated stockpiled soils, sections of pipe, and other materials along pipeline corridors and at project sites could degrade the existing visual character or quality of the site and its surroundings. However, as discussed below, many construction activities would not be visible to the public and recreational users because project sites would be screened by topography, vegetation, and existing man-made features. Moreover, this impact would be temporary.

Los Vaqueros Reservoir Expansion

As discussed above, reservoir expansion would result in an increase in the inundation area of the reservoir. After construction, the reservoir would be filled over an estimated 1-year period. Therefore, the inverse would be experienced as decreased visibility of the lands beneath the water would occur as the reservoir is filled. Although this increase in inundation would be perceptible to anglers, boaters, and hikers within the watershed, it would result in a weak visual contrast, and would not dominate nor obstruct the views of the reservoir and its surroundings from boats and existing/proposed trails.

The maximum water level associated with Alternative 1 would be 560 feet, and the minimum water level would be 460 feet. This fluctuation in water level would occur at certain times of year and leave an exposed strip around the water's edge up to 100 feet thick. This anticipated level of fluctuation is equivalent to fluctuations of the existing reservoir and would be visible to recreational users of the reservoir. Therefore, it would result in a weak visual contrast, and would not dominate nor obstruct the views of the reservoir and its surroundings from boats and existing/proposed trails.

As part of the dam construction, a site of about 36 acres, just upstream of the left abutment of the dam, would be excavated to harvest materials for construction of the dam. This borrow area would be an extension of the borrow area (i.e., roughly triangular-shaped area of the hillside near the dam face) developed for construction of the existing dam (see Figure 4.14-3, Photograph 4). After excavation, grading and contouring of the borrow area to blend with existing and planned topography, a portion of the hillside from an elevation of 600 feet to 1,060 feet msl would remain a flat, rocky surface. A marina complex and its associated parking and other facilities would be built on this flat, rocky surface and to the west. Therefore, the marina complex would generally shield views of the borrow area from boaters, anglers, and hikers. However, views of the marina complex itself would be new to recreational users and would result in a moderate visual contrast.

Because the marina complex would be similar to other watershed buildings in appearance, situated near the water level and tucked into the borrow area and surrounding hills, it would not dominate nor obstruct the views of the reservoir and its surroundings from boats and existing/proposed trails. Moreover, removal of some recreational facilities on the south end would decrease the number of man-made features visible from the eastside trail to the west, improving the visual quality of the south end of the reservoir.

Additionally, installation of connections (i.e., approximately 12-foot-wide dirt/gravel trails) between existing maintenance roads to create the eastside trail would result in a weak visual contrast and would not dominate nor obstruct the views of the reservoir and its surroundings from boats and existing/proposed trails.

New Delta Intake and Pump Station

As previously discussed, views of the new Delta Intake and Pump Station from westbound lanes on SR 4 would be obscured. Views from eastbound lanes on SR 4 would be within the foreground. However, in similar fashion to the existing Old River Intake and Pump Station, many new structures associated with the new Delta Intake and Pump Station would be placed inside a ring levee, which surrounds and creates a visual barrier of the site. Moreover, since the new structures would be similar to those already existing at the Old River Intake and Pump Station, the visual contrast would be weak.

In addition, although views of the new intakes would be within the foreground for recreational users of Old River, intakes already exist next to the site, and views are short in duration as recreational users travel Old River from Discovery Bay to the south Delta. Therefore, the relative change in the views of the new Delta Intake and Pump Station from SR 4, and associated intakes from Old River, would result in a weak visual contrast that would neither dominate nor obstruct the views of Old River and its surroundings from SR4.

Transfer Facility Expansion

As previously discussed, the existing topography around the Transfer Facility Expansion site would obstruct views of its permanent structures from surrounding roadways. Therefore, there would be no changes in the existing visual character or quality of the site and its surroundings.

Pipelines

After installation of the pipelines, the sites would be restored to preconstruction conditions (i.e., reestablishing existing topography and reseeding with a native seed mix typical of the immediately surrounding area). The proposed pipelines (i.e., Delta-Transfer, Transfer-LV, and Transfer-Bethany) would be belowground; blow-off and air valves extend about 2 feet above the ground (See Figure 4.14-8, Photograph 14). Currently blow-off and air valves appear along portions of SR4 and Walnut Boulevard from the Transfer Facility to the dam. New blow-off and air valves would be installed about every 2,000 and 1,000 feet, respectively.

Although drivers along SR4 and Walnut Boulevard as well as recreational users of the Walnut Trail in the watershed could see these structures in foreground views, since these structures would be similar to existing structures, the visual contrast would be weak. Furthermore, as some would be in low-lying areas and vegetation provides intermittent screening along SR4 and Walnut Boulevard, the introduction of these new structures would result in a weak visual contrast and would not dominate nor obstruct views from local roadways or trails.

The valves associated with the Transfer-Bethany Pipeline would be within the foreground view of the public traveling on Vasco Road. However, some of these valves would be placed in low-lying areas along the pipeline alignment and would generally be obscured by the natural topography. Therefore, the introduction of these new structures would result in a weak visual contrast and would not dominate nor obstruct the views from Vasco Road.

Lastly, the inlet/outlet pipelines would not have associated blow-off and air valves. Therefore, since the pipelines would be underground, there would be no changes in the existing visual character or quality of the site and its surroundings.

Power Supply

Power Option 1: Western Only. A new substation, access road to the facility and 69 kV transmission line to the new Delta Intake and Pump Station would be constructed about 2,500 feet south of SR4 and 1 to 1.5 miles east of Byron Highway. The substation and access road would be constructed next to three large existing transmission lines installed on lattice towers. Views of the site are generally obstructed by existing vegetation and development from SR4 and Byron Highway, respectively. Moreover, the substation would be fenced and a landscaping plan to add visual screening would be implemented.

For the portion of the transmission line from the substation east to the new Delta Intake and Pump Station and Old River Intake and Pump Station, existing wooden poles and conductors appear within the alignment. For the portion west to the Transfer Facility, numerous existing electrical facilities including lattice towers, tubular steel poles, wooden poles and conductors appear within a portion of the alignment and within the entire viewshed. Therefore, installation of a new substation, access road, and a new/replacement transmission line would result in a weak visual contrast and would not dominate nor obstruct the views from SR 4 or Byron Highway.

Power Option 2: PG&E and Western. Western's new wooden power poles and transmission line from the Tracy Substation to the new Delta Intake and Pump Station would be visible from Byron Highway. Views from SR 4 for the portion of the transmission line that would be in the same alignment as proposed under Power Option 1 are discussed above. In general, the views of the alignment vary from foreground to background views depending on one's location on Byron Highway. However, these new, approximately 50-foot poles and associated conductors would be within an existing transmission line corridor that contains three transmission lines: two 500 kV lines and one 230 kV line on large lattice towers.

Views of the facilities are intermittently obstructed by topography and man-made features, including farm buildings and houses. Therefore, installation of a new transmission line would result in a weak visual contrast and would not dominate nor obstruct views from SR 4 or Byron Highway.

A portion of the PG&E transmission line would be visible in foreground views from Walnut Boulevard and at the crossing of Camino Diablo Road. Because wooden poles and conductors already exist along these local roadways, installation of a new transmission line would not result in a substantial visual contrast because the new poles and conductors would be similar to what currently exists. Moreover, the proposed substation would be in an area surrounded by steeper topography, limiting views from Walnut Boulevard. Therefore, installation of a new substation and transmission line would result in a weak visual contrast and would not dominate nor obstruct views from Camino Diablo Road or Walnut Boulevard.

Summary

Under Alternative 1, project construction activities and facility siting would result in a weak visual contrast and would not dominate nor obstruct the views of the public or recreational users; therefore, Alternative 1 would not substantially degrade the existing visual character or quality of the site and its surroundings. This would be a less-than-significant impact.

Alternative 2

Under Alternative 2, construction activities and facility siting impacts would be the same as analyzed under Alternative 1 because Alternative 2 includes construction of the same facilities as Alternative 1 does. Therefore, Alternative 2 would not substantially degrade the existing visual character or quality of the site and its surroundings. This would be a less-than-significant impact.

Alternative 3

Under Alternative 3, construction activities and facility siting impacts would be less than Alternative 1 because neither the new Delta Intake and Pump Station nor the Transfer-Bethany Pipeline would be constructed, thereby reducing changes to the existing visual character or quality of the site and its surroundings. Construction activities at the existing Old River Intake and Pump Station would generally take place inside the fenced property and ring levee, which surrounds and creates a visual barrier of the site from SR4.

Installation of a new fish screen within an existing bay, next to an existing screen, would not result in a substantial visual contrast to existing views from Old River. Therefore, construction-related activities and a new fish screen at the Old River Intake and Pump Station would result in a weak visual contrast and would not substantially degrade the existing visual character or quality of the site and its surroundings. This would be a less-than-significant impact.

Alternative 4

Impacts to the existing visual character or quality of the site and its surroundings resulting from implementation of Alternative 4 would be less than from Alternative 1 because this alternative involves a smaller reservoir expansion (160 TAF only) and most of the project components associated with Alternative 1 would not be implemented under this alternative. The following components would not be constructed: Delta Intake and Pump Station, Delta-Transfer Pipeline, Transfer Facility Expansion, Transfer-LV Pipeline, Transfer-Bethany Pipeline, Power Supply Options 1 or 2, or the Marina Complex on the northern shoreline.

Other recreation facilities would be relocated or constructed in different locations compared to Alternative 1; for example, the Westside Access Road would be lower in elevation than proposed under Alternative 1 and recreational facilities would generally be constructed upslope of the existing facilities under Alternative 4, rather than in new locations as under Alternative 1. The following paragraphs discuss impacts resulting from the shell borrow area west of the dam, 160-TAF borrow area, Westside Access Road and relocated recreational facilities associated with Alternative 4.

Reservoir expansion to 160 TAF would result in an increase in the inundation area of the reservoir and some recreational facilities (i.e., marina, boats, docks, and western hiking trail/access road) that are currently on the southern shore would be moved upslope. Currently, the reservoir high water level is about 472 feet msl and with inundation it would rise to a height of 510 feet msl. Although this increase in inundation and relocated recreational facilities would be perceptible to anglers, boaters, and hikers within the watershed, it would result in a weak visual contrast and would not dominate nor obstruct the views of the reservoir or its surroundings from the dam, boats and existing/proposed trails.

Under Alternative 4, the shell borrow area just upstream of the left abutment of the dam would be about 14 acres smaller than under Alternative 1. Moreover, the Marina Complex would not be sited within the borrow area. After excavation, the borrow area site would be graded and contoured to blend with existing and planned topography.

In addition, it is likely that, as occurred with the existing Los Vaqueros Reservoir, the borrow area would naturally revegetate with upland scrub habitat. Therefore, the roughly triangular-shaped area of the hillside near the dam face would become larger, and would result in a weak visual contrast. Moreover, it would not dominate nor obstruct the views of the reservoir or its surroundings from the dam, boats, and existing/proposed trails.

About 270,000 cubic feet of naturally occurring alluvial clay deposits would be excavated from the 160-TAF borrow area in Kellogg Valley. Views from Walnut Boulevard of the 160-TAF borrow area generally would be screened by the Kellogg Creek riparian vegetation; however, it would be visible to hikers on portions of the Alkali Meadow Trail. This would result in a moderate visual contrast and dominate the viewshed of the recreational trail users; however, as the area is in a low-lying valley, it would not block middleground and background views of the valley and surrounding hills.

Generally, under Alternative 4, construction and operations would result in a weak visual contrast and would neither dominate nor obstruct the views of the public or recreationalists. However, impacts associated with excavating the 160-TAF borrow area would substantially degrade the existing visual character and quality of the site and its surroundings and therefore represent a significant impact.

Mitigation Measures

> **Measure 4.14.2a:** CCWD shall develop and implement a site restoration plan specifically for the 160-TAF borrow area that shall provide for finished topography that, while not restored to prior condition, shall blend in with the surrounding landscape, minimizing the visual contrast. The plan shall include a revegetation plan that includes a native seed mix typical of the surrounding area. While these site restoration steps are similar to those that will be required at all project sites, this specific project area requires its own restoration plan because of the extent of ground disturbance that will occur here.

Impact Significance after Mitigation: Less than Significant.

Impact 4.14.3: The project alternatives would not create a new source of substantial light but Alternatives 1, 2, and 3 could create a new source of substantial glare that could adversely affect views in the area. (Less than Significant with Mitigation for Alternatives 1, 2, and 3; Less than Significant for Alternative 4)

Alternative 1

Construction

During the 3-year period associated with construction of the 275-TAF reservoir, the Los Vaqueros Watershed would be closed to public access[2]. Moreover, because the reservoir area is not visible from trails in and around Morgan Territory and Round Valley Regional Preserves, creation of a new source of substantial light or glare from lighting and equipment used during nighttime construction would not be visible to the public or recreational users, and would therefore not result in construction-related impacts.

The watershed would be open to the public during the 1-year reservoir draw down and approximately 1-year reservoir filling period. No new equipment or lighting would be required to drawdown or fill the reservoir; therefore no new source of substantial light or glare would result from drawdown or refilling of the reservoir.

Outside the watershed, site lighting and construction equipment could result in creation of a new source of substantial light or glare. However, as discussed below, many construction activities would not be visible to the public and recreational users due to screening of project sites by topography, vegetation, and existing man-made features. Moreover, this impact would be temporary.

For information on potential impacts to wildlife from the use of lighting during project construction and operation, see Section 4.6, Biological Resources.

Los Vaqueros Reservoir Expansion

When construction is completed, the expanded reservoir, dam, and recreational facilities would have nighttime lighting for safety and security. This lighting would not vary substantially from what is currently used at existing facilities, which is generally shielded light or lamps installed such that the light is directed downwards. Moreover, the Los Vaqueros Watershed is a day-use facility which closes at sunset or earlier and, as discussed previously, is obscured from public views from other recreational facilities. Therefore, operational impacts that could result from creation of a new source of substantial light or glare from the use of lighting for safety and security in the watershed would not be visible to the public or recreational users.

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2 The Miwok Trail would remain open during construction to maintain connectivity between Round Valley and Morgan Territory Regional Preserves; however, this trail offers no views of the Los Vaqueros Reservoir to recreational users. See Figure 4.15-2.

New Delta Intake and Pump Station

During construction, site lighting and construction equipment could be required at night for safety and security. As discussed in Impact 4.14-1, views of the new Delta Intake and Pump Station when driving west on SR 4 would be obscured. Views from SR 4 when driving east would be within the foreground. However, after construction of the ring levee, the majority of the construction activities would be taking place inside the ring levee, which would surround the site and create a visual barrier. Therefore, construction activities associated with the new Delta Intake and Pump Station would not result in a new source of substantial light or glare that would be visible to the public or recreational users.

The permanent structures associated with the new Delta Intake and Pump Station would be similar to the structures currently at the Old River Intake and Pump Station, which are generally painted in light earth tones and are non-reflective. For safety and security, lighting similar to that currently used at the Old River Intake and Pump Station would be installed. Current lighting is generally shielded or installed such that the light is directed downwards. Therefore, the structures and lighting would generally be obscured from view, and operation of the new Delta Intake and Pump Station would not result in a new source of substantial light or glare that would be visible to the public.

Transfer Facility Expansion

During construction, site lighting and construction equipment could be required at night for safety and security. When construction is completed, the Transfer Facility Expansion would have nighttime lighting for safety and security. This lighting would not vary substantially from what is currently used at this site, which is generally shielded, or lamps installed such that the light is directed downwards. Moreover, as discussed previously, public views of the Transfer Facility Expansion would be obstructed from surrounding roadways by the existing topography around the site. Therefore, construction and operation of the Transfer Facility would not result in a new source of substantial light or glare that would be visible to the public or recreational users.

Pipelines

During construction of the Delta-Transfer, Transfer-LV, and Transfer-Bethany Pipelines, site lighting and construction equipment could be required at night for safety and security for the duration of construction. However, because the pipeline construction area moves continuously along the alignment, lighting at any one location would be of limited duration. After completion of construction, no lighting would be required because the pipelines would be underground. Therefore, construction and operation of the pipelines would not result in a new source of substantial light or glare that would be visible to the public or recreational users.

Power Supply

During construction of the transmission lines associated with either Power Option 1: Western Only or Power Option 2: Western and PG&E, lighting could be required at night for safety and security for the duration of project construction. However, because the construction area would move continuously along the transmission line alignment, lighting at any one location would be limited in duration. After completion of construction, no lighting would be required along the transmission lines. Therefore, construction of the transmission line would not result in a new source of substantial light or glare that would be visible to the public or recreational users.

However, installation of new conductor specifically associated with Power Option 1, within an area where no transmission lines currently exist (i.e., along the Delta-Transfer Pipeline corridor) could result in a noticeable visual change during the daytime. The new conductor could be reflective and could cause glare. This effect could result in the new conductor appearing visible or prominent and would therefore result in a potentially significant impact.

Power Option 1: Western Only. A lighting plan to provide security and exterior lighting would be developed for a new substation that would be constructed west of the new Delta Intake and Pump Station. Additionally, structures associated with the new substation could introduce potentially reflective, metal surfaces that could create glare effects. However, views of the site are generally obstructed by existing vegetation and development from SR4 and Byron Highway, respectively. Moreover, the substation would be fenced and a landscaping plan to provide additional visual screening would be implemented. Therefore, operations of the new substation would not result in a new source of substantial light or glare that would be visible to the public or recreational users.

Power Option 2: PG&E and Western. For the proposed substation within the Los Vaqueros Watershed, a lighting plan to provide security and exterior lighting would be developed. Additionally, structures associated with the new substation could introduce potentially reflective, metal surfaces that could create glare effects. However, the substation would be in an area surrounded by steeper topography, limiting views from Walnut Boulevard. Moreover, at night, the substation would not be visible to the public or recreational users as it would be within the watershed, which closes at sunset or earlier. Therefore, construction and operation of a new substation would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users.

Summary

Under Alternative 1, project construction and operations would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users. However, a conductor within an area where no transmission lines currently exist could result in a noticeable visual change during the daytime. Therefore, operation of Power Option 1 could result in a new source of substantial glare that would be visible to the public from SR 4. This would be a significant impact.

Alternative 2

Under Alternative 2, construction and operational impacts would be the same as analyzed under Alternative 1 because Alternative 2 includes implementation of the same facilities as does Alternative 1. Therefore, Alternative 2 could result in a new source of substantial glare that would be visible to the public. This would be a significant impact.

Alternative 3

Under Alternative 3, construction and operational impacts would be less than Alternative 1 because neither the new Delta Intake and Pump Station nor the Transfer-Bethany Pipeline would be constructed, thereby eliminating the need for construction and safety/security lighting at either location. Construction activities at the existing Old River Intake and Pump Station would take place inside the fenced property and ring levee, which surrounds the site and creates a visual barrier of the site. Because safety and security lighting are already in place; additional lighting would not likely be required and there would be no additional light impacts. However, as described for Alternative 1, the new conductor associated with Power Option 1 could be a substantial source of glare, representing a significant impact.

Alternative 4

Impacts from implementation of Alternative 4 would be less than from Alternative 1 because this alternative involves a smaller reservoir expansion (160 TAF only) and most of the project components associated with Alternative 1 would not be implemented under this alternative. The following components would not be constructed: Delta Intake and Pump Station, Delta-Transfer Pipeline, Transfer Facility Expansion, Transfer-LV Pipeline, Transfer-Bethany Pipeline, Power Supply Option 1 or 2, or the Marina Complex on the northern shoreline.

Impacts resulting from the construction and operations of the shell borrow area west of the dam, 160 TAF borrow area, Westside Access Road, and relocated recreational facilities associated with Alternative 4 would be the same as those discussed under Alternative 1. All construction and operations would require site and safety lighting as described for Alternative 1, and all the facilities would be within the Los Vaqueros Reservoir area. Therefore, Alternative 4 would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users.

Mitigation Measures

Measure 4.14.3: Non-specular conductors shall be installed to reduce the potential glare effects and the level of visual contrast between the transmission line and its landscape setting.

Impact Significance after Mitigation: Less than Significant.

Impact 4.14.4: The project alternatives would not make a cumulatively considerable contribution to adverse effects on visual/aesthetic resources in the project area or broader region. (Less than Significant)

The geographic scope considered for potential cumulative impacts to visual/aesthetic resources is the viewshed of the public and recreational users common to the project alternatives. Within the viewshed of the project alternatives, the Vasco Road and Camino Diablo Intersection Improvements Project, in combination with the proposed project, could contribute to cumulative impacts to the visual/aesthetic resources. Specifically, construction activities and equipment could obstruct views from Vasco Road, a county-designated scenic highway/expressway, and Camino Diablo Road, a scenic route. Impacts from construction would be limited in duration and therefore would not result in significant impacts.

After construction, the road widening would be visible within foreground views; however, it would not obstruct or dominate the views of the public. Moreover, as discussed above, within this viewshed, permanent impacts from Alternatives 1 and 2 would be limited to air valves and blow-off valves that would generally not be visible to the public. Some air valves and blow-off valves may be visible; however, as discussed above, due to the existing character of the viewsheds, installation of air valves and blow-off valves would result in a weak visual contrast to the existing viewsheds. Therefore, the project’s contribution to cumulative impacts to visual/aesthetic resources would not be cumulatively considerable. This would be a less-than-significant cumulative impact.

Mitigation: None required.

4.15 Recreation

This section provides an analysis of potential impacts on recreational facilities that would result from implementation of the Los Vaqueros Reservoir Expansion Project. The analysis includes a description of the environmental setting, the associated regulatory framework (including all applicable recreational policies), the methodology, and the impact assessment. Mitigation measures are identified, where appropriate, to avoid or reduce potential impacts.

4.15.1 Affected Environment

Regulatory Setting

Federal and State

No federal or state regulations specifically apply to recreational activity in the Los Vaqueros Watershed, with the exception of state limits on body contact recreation in domestic water supply reservoirs (see California Health and Safety Code section 115825(b)). The U.S. Environmental Protection Agency and the California Department of Health Services prescribe regulations that limit the contaminants in water provided by public water systems.

Local

Contra Costa County General Plan

Goals and policies in the Contra Costa County General Plan (Contra Costa County, 2005) pertaining to recreation are provided in Appendix E-2. These goals and policies include the following:

- Retention of important creeks and streams in order to maintain recreation opportunities (8-79)
- Preservation and protection of the County's recreational resource lands (Goal 9-A)
- Development of properly designed park and recreational facilities for the County's residents (9-36)
- Promotion of recreational enjoyment of the County's amenities for the health, safety, and welfare of its residents (9-38)
- Protection and provision of public access to scenic areas on waterfronts, including water-recreation such as fishing, boating, and picnicking (9-43)

Alameda County East County Area Plan – A Portion of the Alameda County General Plan

Goals and policies in Alameda County's East County Area Plan (Alameda County, 2002) pertaining to recreation are provided in Appendix E-1. These goals and policies are as follows:

- Preservation and protection of recreational resource lands of East County (9-A)
- Consideration of recreational benefits when determining cost and benefits of alternative drainage system improvements (Policy 7-41)

Contra Costa Water District

The Contra Costa Water District (CCWD) Board of Directors adopted a set of principles by which it would participate in the planning and development of the Los Vaqueros Reservoir Expansion Project, as presented in Chapter 2, Project Background. One of the CCWD Board Principles states that CCWD will not support an expansion of Los Vaqueros Reservoir unless the project preserves and increases the recreational opportunities of the original Los Vaqueros Reservoir. CCWD is responsible for implementing the Watershed Management Program and the Resource Management Plan described below.

Ordinance 01-01

CCWD has adopted a specific ordinance for managing resources in the Los Vaqueros Watershed. CCWD Ordinance 01-01 states:

> "The rules and regulations included herein are necessary or convenient for the control, operation, and protection of the reservoir and surrounding land Contra Costa Water District owns, operates, or controls; for the control, operation, and protection of structures and facilities, and equipment used in connection with the reservoirs; for the protection of property, watersheds, and watercourses; for the due operation, management, or control of the property; to prevent water pollution; and to protect the health and safety of its customers and other members of the public."

Article 3 of CCWD Ordinance 01-01 further defines specific restrictions on activities that could occur in the watershed including prohibition of body or clothing contact in any District water body and operating any vessel without a permit. The full list of restrictions is included in Appendix E-4.

Watershed Management Program

The Watershed Management Program (Brady and Associates, 1997) provides programs for the management of the watershed but does not include management programs for public access or recreation. One major program goal pertinent to the project includes provision of recreational facilities and programs and public access at a reasonable cost for users. The program also consists of several objectives such as the following: to provide opportunities for both passive and active recreational uses, to protect the watershed's natural and cultural resources, and to provide recreational activities and programs that are consistent with water quality and reliability goals. A complete list of the Watershed Management Program's objectives is contained in Appendix E-4.

Resource Management Plan

Recreation policies for the watershed were originally outlined in the Los Vaqueros Resource Management Plan (Brady/LSA, 1999) and subsequently formulated into broad guiding policies based on enactment of Ordinance No. 01-01 by the CCWD Board of Directors in September 2001. The Resource Management Plan includes recreation and public access goals such as: "Provide recreational facilities and programs and public access at reasonable costs that are distributed equitably among users." Other policies prevent access to watershed areas between Los Vaqueros Road and Vasco Road due to property ownership, protection of water quality, steep terrain, and protection of biological and cultural resources (R-7) and prevention of road access from the west through East Bay Regional Park District (EBRPD) lands (R-8). Policies relevant to trail development and maintenance within the watershed call for minimizing erosion and other impacts to water quality in the watershed, observing a minimum 100-foot setback from the reservoir to minimize sediment transport, and only permitting equestrian and bicycle use when they would not contribute to erosion and trail degradation as determined by CCWD watershed staff (T-7 and T-8). These policies and restrictions are listed in Appendix E-4.

Regional Recreational Opportunities

The project is located in southeastern Contra Costa County and northeastern Alameda County. The region offers a variety of recreational opportunities in both urban and outdoor settings, which are illustrated in **Figure 4.15-1**. Mount Diablo State Park serves as the northwestern anchor of a series of outdoor recreational areas that extend through the Diablo Range. The EBRPD Morgan Territory Regional Preserve links Mount Diablo State Park to the Los Vaqueros Watershed, which forms the southeastern anchor of this extensive open space and recreation system.

Several smaller EBRPD lands border the state park on the west and the southeast. These include: Vasco Caves Regional Preserve (owned jointly by EBRPD and CCWD), Round Valley Regional Preserve, Brushy Peak Regional Preserve (partially owned by the Livermore Area Park District), the San Francisco Bay to San Joaquin Delta Trail, and the Diablo Trail. To the north of the watershed is the Cowell Ranch Open Space, currently being collaboratively planned for state park use by California State Parks and the City of Brentwood. This open space is not yet open to the public and currently has no recreational facilities. Other accessible public lands lie to the north and east, where San Francisco Bay and Delta waterways provide recreational boating, fishing, and camping opportunities. To the south, Lake Del Valle (also operated by EBRPD) provides additional boating, fishing and camping facilities.

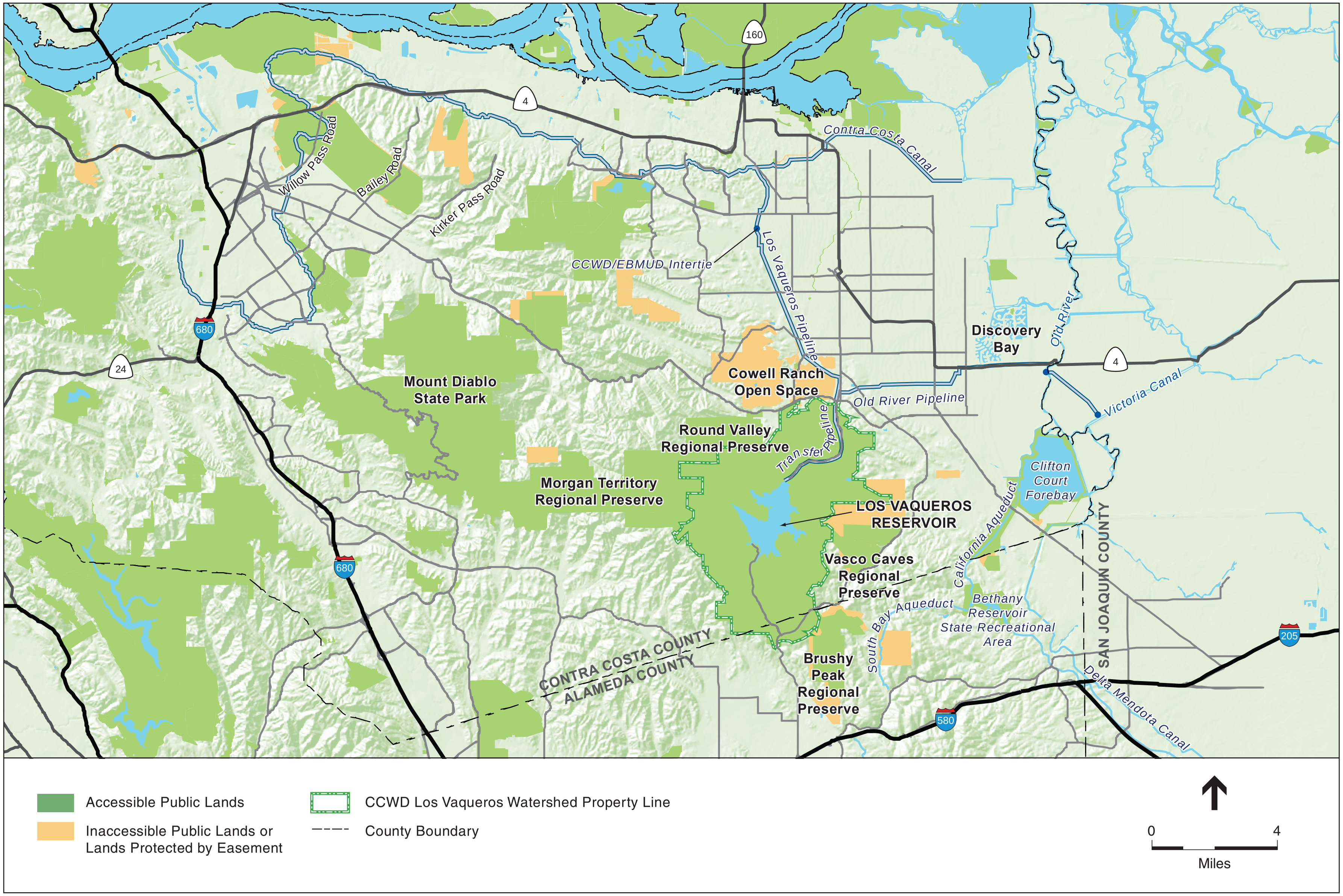
Additional recreational facilities include the Bethany Reservoir State Recreation Area which surrounds Bethany Reservoir at the southeast end of the project area. This recreation area, managed by California State Parks, is used primarily for day-use activities, water-oriented recreation, and biking along the California Aqueduct.

Local Recreational Opportunities

Los Vaqueros Watershed

The Los Vaqueros Watershed provides day-use opportunities for hiking, biking, boating, fishing, and horseback riding. Recreational facilities and trails within the watershed are illustrated in **Figure 4.15-2**. **Table 4.15-1** provides additional detail on the existing facilities.

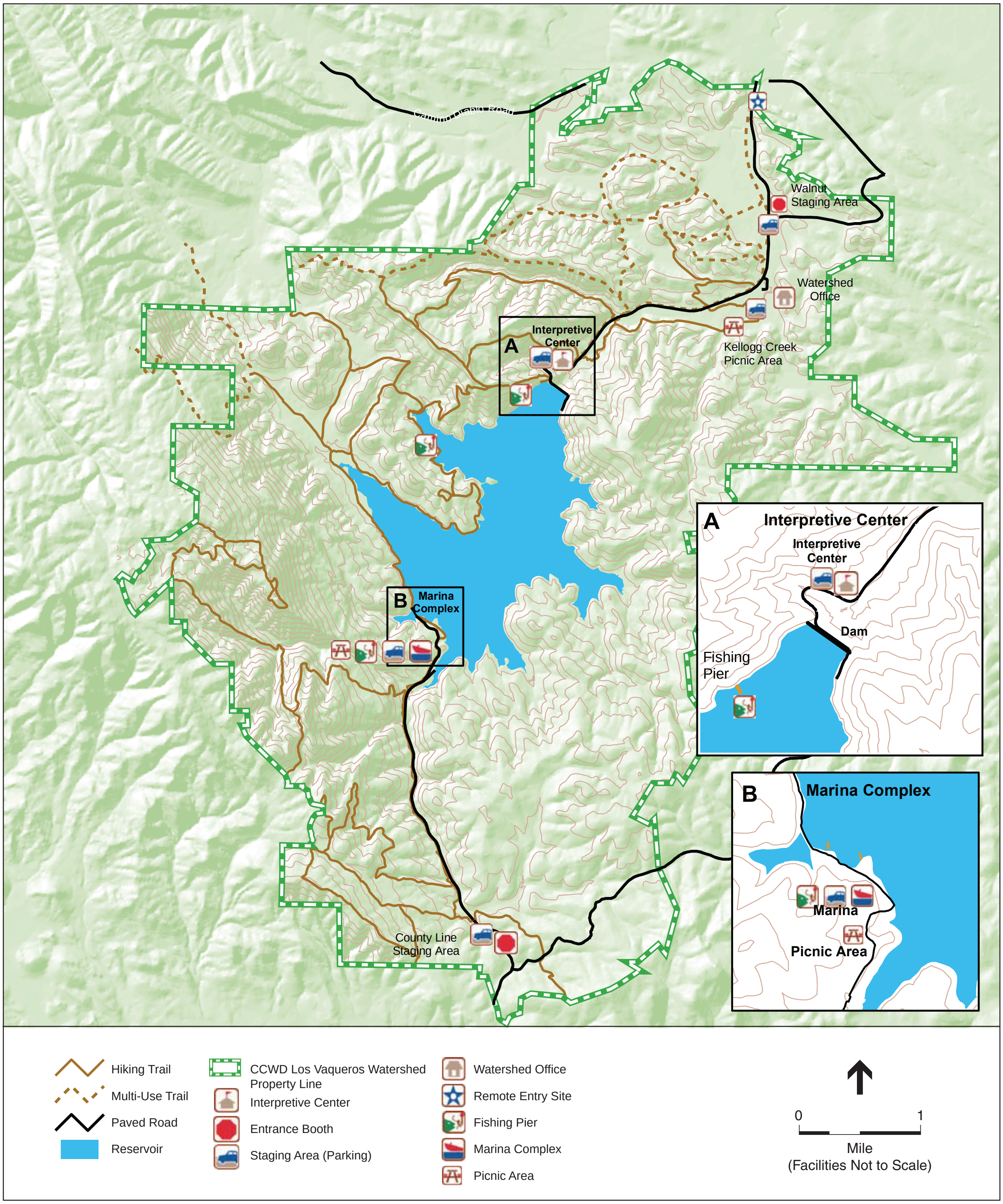
Public vehicle access to the watershed is limited to (1) the Marina, concession, and picnic area on the southern shore of the reservoir, and (2) the Interpretive Center, Watershed Office, and day-use facilities near the existing Los Vaqueros Dam on the north end of the watershed. The Interpretive Center, Watershed Office, and day-use facilities near the dam are accessed via Walnut Boulevard, which connects to Camino Diablo near the intersection with Vasco



SOURCE: USGS, 1993 (base map); Contra Costa County, 2005; and ESA, 2007

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.15-1
Recreation and Open Space Areas



SOURCE: USGS, 1993 (base map); and Contra Costa Water District, 2005

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.15-2
Existing Los Vaqueros Watershed Facilities

TABLE 4.15-1
LOS VAQUEROS RESERVOIR EXISTING DAY-USE FACILITIES

	Parking	Equestrian/ Bus Parking	Toilets	Display Panel	Picnic Tables	Barbeque Units	Fishing Piers	Miscellaneous Facilities
Areas Below Dam								
Walnut Staging Area (North Entry)	32	13	1	1	2	–	–	–
Kellogg Creek Picnic Area	40	–	4	1	11	11	–	Three metal-roof shade shelters covering seven picnic tables
Interpretive Center/ Dam Staging Area	85	2	2	1	10	4		Outdoor amphitheater at the Interpretive Center
Top of Dam			1	1				Visitor-use toilet
Areas Above Dam								
Southwest of Dam							1	Fishing pier
County Line Staging Area (South Entry)	29	–	1	1	1	–	–	
Los Vaqueros Staging Area	61	–	2	1	–	–	1	Americans with Disabilities Act ramp to fishing pier
Oak Point Picnic Area	–	–	–	–	7	3	1	Visitor-use toilets at Marina or Los Vaqueros Staging Area
Marina	59	–	6	–	6	–	–	Marina building, fish-cleaning station, outdoor amphitheater, pay phone, drinking fountain, Marina Manager's residence
Knoll Picnic Area	21	–	1	-	18	9	–	Picnic tables
Northwest Cove	–	–	1	–	–	–	1	Fishing pier
Trails								
Hiking-Only Trails								39.2 miles*
Multi-use Trails (for hiking, bicycling, and horseback riding)								15.8 miles* – almost all multi-use trails are outside the reservoir drainage area
Total	**327**	**15**	**18**	**6**	**55**	**27**	**4**	**55 miles of trails***

* Note: trail length calculated using GIS coverage.

SOURCE: ESA, 2008.

Road. Marina access is provided via a 3.75-mile-long public road that connects to North Vasco Road. Aside from the Marina, facilities at the southern end of the reservoir include a concession building, trailheads, picnic area, and fish-cleaning stations. The public can rent electric boats at the Marina near the concession building; private boats are prohibited on the reservoir. To protect the public water supply, activities involving body or clothing contact with the water also are not allowed at the reservoir. Two fishing piers at points along the west side of the reservoir and a fishing platform on the western edge of the dam allow visitors to fish along the western shoreline.

As shown in Table 4.15-1, the watershed has more than 39.2 miles of hiking-only trails, and about another 15.8 miles of multi-use trails. Hiking-only trails align the west side of the reservoir and extend north and south of the reservoir through the watershed (see Figure 4.15-2). No public access is provided along the east side of the reservoir. Of the 15.8 miles of multi-use trails provided for hiking, biking, and horseback riding, all but about 1 mile are outside the reservoir watershed drainage area to the north. The short segment of the Miwok Trail within the reservoir watershed drainage area connects Round Valley Regional Preserve to the Morgan Territory Regional Preserve via the Adobe Trail (see Figure 4.15-2).

4.15.2 Environmental Consequences

Methodology

This impact assessment focuses on the effects that the project could have on local recreational opportunities and park resources. The analysis assumes that public demand for recreational opportunities and use of recreational facilities is likely to increase at a rate commensurate with additional population growth contemplated by current growth projections. Expansion of Los Vaqueros Reservoir would not induce population growth or cause increased demand for recreational facilities.

Significance Criteria

The thresholds for determining the significance of impacts for this analysis are based on the environmental checklist in Appendix G of the State CEQA Guidelines. These thresholds and the following impact analysis also encompass the factors taken into account under NEPA to assess environmental impact of an action in terms of the context and the intensity of its effects. Accordingly, the project and alternatives would result in a significant impact on recreation resources if it would do any of the following:

- Substantially reduce recreational opportunities or substantially degrade recreational experiences
- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated
- Include recreational facilities or require the construction or expansion of recreational facilities that might have a significant adverse physical effect on the environment

With respect to the third impact significance criterion listed above, as described in Section 3.5.5, Recreational Facilities, recreational facilities are part of the project alternatives. Recreational facilities inundated by reservoir expansion or otherwise affected by project construction would either be relocated or replaced within the watershed. Additional recreation facilities would also be constructed within the watershed. Accordingly, impacts associated with the construction of recreation facilities included as part of the project alternatives are assessed throughout the EIS/EIR and therefore are not further evaluated in this section.

Impact Summary

Table 4.15-2 provides a summary of the impact analysis for issues related to recreation based on actions outlined in Chapter 3.

TABLE 4.15-2
SUMMARY OF IMPACTS – RECREATION

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.15.1: Construction of the project alternatives would result in a short-term reduction of recreational opportunities in the project area due to construction activities outside the watershed and closure of the watershed to the public during the construction period, but would enhance recreational opportunities in the long-term.	LSM	LSM	LSM	LSM
4.15.2: The project alternatives would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	LS	LS	LS	LS
4.15.3: No other reasonably foreseeable future projects would also reduce recreational opportunities in the project area, similar to those opportunities affected by the project alternatives, or increase the use of existing neighborhood and regional parks or other recreational facilities; therefore, there does not appear to be the potential for the project alternatives to contribute to a cumulative effect on recreation facilities, opportunities or experience.	LS	LS	LS	LS

NOTES:
SU = Significant Unavoidable Impact
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Implementation of this alternative would neither temporarily nor permanently affect existing recreational resources, opportunities, or experiences.

Impact 4.15.1: Construction of the project alternatives would result in a short-term reduction of recreational opportunities in the project area due to construction activities outside the watershed and the closure of the watershed to the public during the construction period, but would enhance recreational opportunities in the long-term. (Less than Significant with Mitigation)

Alternative 1

Effects to Los Vaqueros Reservoir Recreation Facilities

The Los Vaqueros Watershed would be closed to all public access during the estimated 3-year project construction period with the exception of a short segment of the Miwok Trail to maintain connectivity between Round Valley and Morgan Territory Regional Preserves. This restriction of public access and use is necessary for public safety during the construction period due to the substantial amount of construction activity that would be occurring within the watershed along with the substantial construction traffic, including movement of heavy equipment and materials. Consequently, during the construction period there would be no recreational use of Los Vaqueros Reservoir (i.e., Marina, fishing piers and shoreline areas), the day-use area, the Interpretive Center, or the 55 miles of trails. Moreover, during the 1-year period prior to the start of construction activities when the reservoir would be drawn down as well as during the 1 year after project completion when the reservoir would be filled, water-related activities (i.e., boating and fishing) would be restricted.

With completion of the project, replacement and new facilities would be available for public use once more. The CCWD Board Principles established for this project (see Section 2.2.2) call for improving and increasing recreational opportunities at Los Vaqueros Reservoir. To implement these principles, the project includes construction of new recreational facilities at the expanded reservoir capable of meeting current user needs, provides opportunities similar to those present in the watershed, and adds new facilities that would enhance the public's recreational opportunities. Recreational facilities for the proposed action and alternatives are discussed in Section 3.5.5 and summarized here.

Reservoir expansion from 100 thousand acre feet (TAF) to 275 TAF would result in inundation of several existing recreation facilities including the Marina and concession stand/bait shop, fishing piers, shoreline access along the west side of the reservoir, and some picnic and parking areas and trails near the reservoir. All existing recreation facilities that would be affected by the project would either be relocated or replaced with a new facility in the watershed. In addition, as part of the project, some recreational facilities and opportunities would be expanded.

The existing Marina on the south end of the reservoir would be replaced with a new Marina Complex at the north end of the reservoir near the dam. This new complex would be next to the proposed dam borrow area. A flat area of about 11 acres (about 280 feet wide by 2,100 feet long) would be created on the borrow area site near the dam. Once borrow materials have been excavated from this site it would be graded to accommodate a new, second interpretive center, amphitheater, parking, staging and picnic areas. Due west, an additional 5-acre flat area would be graded to accommodate the Marina Manager's residence, Marina building, docks, fishing piers, picnic area, and parking.

The Marina Complex would provide the same facilities as the existing Marina and would be compliant with the Americans with Disabilities Act. It would include a concessioners' stand/bait shop, new fishing piers, a new fish cleaning station, boat dock parking, and picnic areas. The boat dock would provide for an increased number of electric powered boats for rent (50 instead of the existing 30), and the two existing 18-foot pontoon boats, along with covered berths for three boats for rescue and water quality sampling. Movable floating docks would be constructed to allow boat access under a range of reservoir surface elevations.

At the southern end of the reservoir, four piers would be relocated, one additional fishing pier would be built, and fishing facilities such as a new fish cleaning station would be constructed uphill of the existing Marina area (see Figure 3-28). Day-use facilities would also be relocated. One picnic area would be relocated uphill of the existing southern Marina, one would be moved to the new Marina Complex, and a third picnic area would be established at the new parking area at the south end of the reservoir. Hiking trail access would be provided at this new parking area (see Figure 3-28).

About 8 miles of hiking-only trails would be replaced with 15.5 miles of hiking-only trails that would provide access to the same areas and recreational experiences as were available before the reservoir expansion. Both service road and recreational access roads would also be replaced. An optional 14.5-mile Eastside Service Access Road/Hiking Only Trail is proposed as well as the 11-mile Westside Service Access Road/Hiking Only Trail. The replacement trails would maintain comparable reservoir and landscape views. Trail connectivity with regional trails in the EBRPD's Morgan Territory and Round Valley Regional Preserves would be preserved.

Southern access to the Westside Trail would be available from Los Vaqueros Road. The new optional 14.5-mile Eastside Service Access Road/Hiking Only Trail would be constructed along the southeastern portion of the reservoir, connecting existing access roads in the south and eastern portion of the watershed. A park bench is proposed for a peninsula in the southern portion of the watershed for viewing. A parking lot would be near the upper reservoir inundation limit and would provide direct access to the trailhead. The site would have picnic tables, toilet facilities, and a water station. Overall, there would be a net increase in the trails available for public use.

Upon completion of the project, existing, replacement and additional new facilities would be available for public use again, thus improving recreational opportunities and enhancing recreational experiences.

Effects on Recreational Facilities Outside Los Vaqueros Reservoir

Construction of facilities outside the watershed including the new Delta Intake and Pump Station, Delta-Transfer Pipeline, a portion of the Transfer-Los Vaqueros (LV) Pipeline, Transfer Facility Expansion, Transfer –Bethany Pipeline, Power Option 1: Western Area Power Administration (Western) Only and the Western Portion of the Power Option 2: Western & Pacific Gas and

Electric (PG&E) would not substantially reduce or degrade existing recreational opportunities. These facilities would not intersect or impede the use of any existing recreational facilities.

The new Delta Intake and Pump Station would be constructed on the west side of Old River just south of Highway 4. Old River provides recreational access to boaters and anglers from Discovery Bay to the southern Delta. Construction of the new Delta Intake and Pump Station would require the use of a cofferdam within the waterway; however, the channel at this location is about 100 feet wide and boat access would not be impeded.

The Delta-Transfer and Transfer-LV Pipelines would be installed along the east side of Walnut Road across the road from the southeastern-most edge of the Cowell Ranch Open Space (Figure 4.15-1). This approximately 3,500-acre property, currently being collaboratively planned for state park use by California State Parks and the City of Brentwood, is not yet open to the public and has no recreational facilities. If visitor use is initiated before construction of the project begins, then project construction might temporarily affect visitor vehicle access to this area (e.g., causing access delays, but not closure) but it would not reduce the recreational opportunities that might be provided at the ranch.

Construction related to the Transfer Facility Expansion would occur within the fence line of the existing facility where no recreational facilities or uses exist; therefore, there would be no recreational impact.

The Transfer-Bethany Pipeline would terminate at the southwestern-most corner of Bethany Reservoir. The pipeline trench associated with the Eastside Option would traverse about 0.3 mile of the Bethany Reservoir State Recreation Area. This recreation area is primarily used for water-oriented recreation, especially fishing and windsurfing. Recreational users do not have access to the southwestern part of this recreation area where project construction activities would occur and no developed recreational facilities, such as the California Aqueduct Bikeway, would be crossed by the project pipeline or tunnel alignments. Therefore, there would not be a reduction of recreational opportunities at the Bethany Reservoir State Recreation Area.

Regarding the additional power facilities, Power Option 1 would include use of an existing 230-kilovolt (kV) transmission line, installation of a new Western substation at the eastern terminus of Camino Diablo Road, upgrade of an existing single-circuit power line to Old River Intake and Pump Station, and installation of a new distribution line which would be within the Delta-Transfer Pipeline alignment. The new substation would not displace any existing recreational facilities nor would it be near any recreational facilities. Likewise, the proposed distribution line and power line upgrade would occur within existing utility alignments; therefore, there would be no recreational impacts.

The portion of Power Option 2 outside the watershed would include construction of a new 69-kV power line from the Tracy Substation south of the Harvey O. Banks Pumping Plant to the intersection of an existing 69-kV power line to the Old River Intake and Pump Station. There are no recreational facilities or uses along any portion of Power Option 1 and Power Option 2 outside the watershed.

Therefore, construction of facilities outside the watershed would have no impact on recreational facilities or opportunities since the proposed construction areas would not displace, intersect or impede the use of any recreational facilities.

Impacts to Planned Recreational Facilities

EBRPD has identified development of two trails in the vicinity of project facilities in its recently published 2007 Master Plan Map. The plan shows a proposed Delta Trail Extension along Old River and the South Pacific Rail Road Trail near Clifton Court Forebay. According to EBRPD, the Delta Trail Extension could be developed in the next 3 to 5 years, dependent on funding and acquisition of property rights and an encroachment permit from Reclamation District 108 (Townsend, 2008). This trail is identified to extend along Old River through the area proposed for the new Delta Intake and Pump Station.

The new Delta Intake and Pump Station would require construction of a new levee and breaching of the existing levee in order to build the facility. If this trail were to be constructed and opened for public use before construction begins on the project, then it would need to be closed during the 2-year construction period of the new Delta Intake and Pump Station, which would temporarily reduce this recreational hiking opportunity.

The South Pacific Railroad Trail (Trail 44 on Master Plan Map), also identified on the 2007 Master Plan Map, is projected by EBRPD to be constructed and open in the 2013 to 2018 timeframe. The trail is proposed to run next to and within the railroad right of way. A small portion of this planned trail would cross the proposed 69-kV, double-circuit power line associated with Power Option 2: Western & PG&E. It is standard industry practice for power lines to be constructed to span railroad rights of way; therefore, recreational access would not be impeded. Furthermore, due to existing power facilities and other industrial features within the vicinity of the proposed trail, the 69-kV, double-circuit power line would not substantially degrade the recreational experience.

Summary

Alternative 1 has the potential to impact recreational opportunities and experiences in the short-term due to the 3-year closure of the watershed, additional 2-year restriction on water-related activities (i.e., water recreation would be closed a total of 5 years to allow for reservoir draining, dam modification construction and expanded reservoir refill), and a potential 2-year interruption of the EBRPD’s Delta Trail Extension if this trail is completed during a time frame that conflicts with project construction activity. This would be a significant impact.

However, there would not be substantial long-term adverse effects on recreational opportunities and experiences. Following completion of project construction, the watershed would reopen to public access and all previous recreational uses. Recreational opportunities and recreational experiences would be enhanced because there would be a net increase in recreational facilities within the watershed (i.e., an expanded Marina, additional fishing piers and support facilities, additional miles of trails, and a second Interpretive Center).

Alternative 2

Impacts related to recreational opportunities and experiences resulting from construction of the project under Alternative 2 would be the same as analyzed under Alternative 1 because Alternative 2 includes construction of the same facilities as does Alternative 1.

Alternative 3

Construction related impacts to recreational opportunities and experiences resulting from construction activities in the watershed would be the same under Alternative 3 as analyzed under Alternative 1 because Alternative 3 also includes construction of a 275-TAF reservoir and all of the same associated activities and facilities in the watershed.

Outside the watershed, Alternative 3 differs from Alternative 1 in that it includes expansion of the Old River Intake and Pump Station, rather than construction of the new Delta Intake and Pump Station, and it does not include construction of the Transfer-Bethany Pipeline. However, because construction of facilities outside of the watershed would not disrupt or degrade use of an existing recreational facility, these differences in Alternative 3 compared to Alternative 1 do not alter the project impacts. Similar to Alternative 1, construction of facilities outside the watershed under Alternative 3 would have no impact on recreational facilities, opportunities or experience.

Regarding potential impacts to the planned Delta Trail Extension identified by EBRPD to extend along Old River, construction at the Old River Intake and Pump Station would not require closure of this trail if it is in place by that time. The Old River Intake and Pump Station is an existing facility on the river bank. Any trail extended along Old River past this existing facility would have to be developed inland of this facility since public access is not permitted through the facility site. Although trail use would not be impeded, noise, dust, and vibration from construction activities could result in short-term degradation of the user experience in the immediate vicinity of the project construction site. Because the project effects on this planned recreational trail would be short-term and localized they would be less than significant. Impacts related to the South Pacific Railroad would be the same for Alternative 3 as described under Alternative 1.

Summary

Impacts related to recreational opportunities and experiences from implementation of Alternative 3 would be less than Alternative 1 because the new Delta Intake and Pump Station would not be constructed; therefore a potential 2-year interruption of the EBRPD's Delta Trail Extension use would not be required. However, there could be short-term localized impacts due to construction activities at the Old River Intake and Pump Station. In summary, although impacts are reduced, Alternative 3 would still result in significant impacts to recreational opportunities and experiences due to the closure of the watershed and restricted water-related activities.

Alternative 4

Similar to Alternative 1, the watershed would be closed to the public and no recreational activities would be available during the project construction period. The construction period for this alternative is 2 years, rather than the 3-year period required for Alternatives 1, 2, and 3. However, unlike Alternatives 1, 2 and 3, it is anticipated that not all water-related activities would be restricted during the one-year draw down and subsequent one-year refilling of the reservoir. It is likely that shoreline fishing opportunities would be available and boating may be available depending on the water level retained after draw down. After completion of construction, enhanced and expanded recreation facilities and opportunities at the Los Vaqueros Reservoir would be re-opened for public use.

Under Alternative 4, the same recreational facilities in the watershed would be inundated as described under Alternative 1. Because the reservoir would be expanded to 160 TAF rather than 275 TAF under this alternative, an opportunity would arise to relocate existing recreational facilities differently than proposed for Alternatives 1, 2, and 3. Specifically, the existing Marina, concession stand/bait shop and Marina parking area would be relocated upslope of its existing location on the south end of the reservoir, rather than being relocated to the north end of the reservoir as proposed for Alternatives 1, 2, and 3. About 6 miles of trails and 4.6 miles of the unpaved west side access road would be inundated and would be relocated along the perimeter of the expanded reservoir. This would result in an additional 9.5 miles of trails and 5.4 miles associated with the west side access road. Moreover, a new east side trail could be installed. Additionally, four fishing piers and the picnic areas and restrooms associated with the Marina would also be generally relocated upslope of their existing locations. Therefore, recreational opportunities and experiences would be greater with implementation of the project due to the increased mileage of hiking trials, west side access road, and potentially an east side trail. (See Figure 3-29.)

Unlike Alternative 1, there would be no construction of facilities outside the watershed under Alternative 4; therefore there would be no impacts on existing recreational facilities or uses as well as no potential for impact to the planned EBRPD Delta Trail Extension.

Summary

Impacts related to recreational opportunities and experiences from implementation of Alternative 4 would be less than Alternative 1 because no facilities outside the watershed would be constructed, the reservoir would be smaller, access to recreation would be limited for a shorter duration, and recreational facilities would generally be moved upslope. However, impacts of Alternative 4 would still be significant due to the closure of the watershed during construction and restricted access for water-related activities during drawdown and filling of the reservoir. Like Alternative 1, following completion of project construction, the watershed would reopen to public access and all previous recreational uses. Recreational opportunities and recreational experiences would be enhanced because there would be a net increase in recreational facilities within the watershed (i.e., additional miles of trails).

Mitigation Measures

Measure 4.15.1a: Before any recreational facilities are closed in the watershed, CCWD shall prepare and implement a public outreach program and promote the program via the web, billing inserts, and other methods to inform current and potential recreational users of the temporary closure of the Los Vaqueros Reservoir day-use facilities and inform customers of other recreational opportunities in the area.

Measure 4.15.1b: If EBRPD's proposed Delta Trail Extension is developed and open to the public before or during construction of the new Delta Intake and Pump Station, CCWD shall provide EBRPD with an anticipated closure schedule; prepare and implement a public outreach program and promote the program via the web, billing inserts, and other methods to inform current and potential recreational trail users of the temporary closure of the Delta Trail Extension and inform customers of other recreational trail opportunities in the area; and place signage to the north and south of the new Delta Intake and Pump Station site along the trail to inform recreational users of the trail closure, alternative trail options, and anticipated timing for the reopening.

Impact Significance after Mitigation: Less than Significant.

Impact 4.15.2: The project alternatives would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated. (Less than Significant)

Alternative 1

The project would not include residential development nor would it induce population growth that would increase the demand for local or regional recreational facilities. Likewise, the project would not directly increase the number of day-use visitors using existing recreational facilities or necessitate the construction of new recreational facilities. However, as described above, during the estimated 3-year project construction period, there would be full closure of the recreational facilities at the watershed. Consequently, there would be no recreational use of Los Vaqueros Reservoir, its day-use areas, or the 55 miles of trails during the 3-year construction period (with the exception of the short segment of the Miwok Trail). Moreover, during the one year period prior to the start of construction activities when the reservoir would be drawn down as well as during the one year after project completion when the reservoir would be filled, water-related activities (i.e., boating and fishing) would be restricted.

It is possible that closure of the watershed would create more demand for other recreation facilities. Information on use of the watershed for recreational purposes gives an indication if demand at other facilities might increase and the extent of increased demand during the 3-year construction period and additional 2-year restriction for water-related activities.

CCWD employs a concessionaire, the Los Vaqueros Recreation Company, to provide recreational services and facility maintenance at Los Vaqueros Reservoir as well as to collect data regarding visitor use. Data gathered between September 2001 and June 2002 show 15,292 cars entering at both the north and the south entries and show that 74 percent of the visitors to the reservoir use the south entry. Visitor data, documenting attendance by month over a 7-year period (July 2001 through June 2008), indicates that annual attendance ranges by year from 28,966 (year ending June 30, 2002) to 23,717 (year ending June 30, 2008) with most visitors to the watershed during the spring (March to May) and autumn (September and October). Recent visitor data indicates that the large majority of visitors continue to enter the watershed lands from the south to use fishing facilities in the Marina area.

The Los Vaqueros Watershed offers a number of recreational and educational opportunities. According to CCWD staff, in 2002, about 90 percent of Los Vaqueros visitor use was for fishing (Nuzum, 2002). More recently, during the 2007-2008 fiscal year, 20,237, or 85 percent of the visitors to the reservoir, purchased daily fishing access pass permits. CCWD watershed staff note that fishing increases substantially whenever the reservoir is stocked (Mueller, 2008). Besides fishing, the watershed offers general hiking opportunities as well as several annual athletic events that attract hundreds of runners and bicyclists for single-day visits.

Additionally a number of education and outreach programs are hosted by CCWD. Specifically, the Watershed Connections Field Trip is held about 92 times per year at the Interpretive Center. The program was attended by about 3,400 school children and about 550 adults during the July 1, 2007 to June 30, 2008 timeframe (Hook, 2008). CCWD also sponsors a variety of weekend programs, generally held every other weekend, covering a variety of topics, as well as Public Outreach Tours four times a year where visitors spend time at the Interpretive Center and in the Marina area.

The existing annual visitors, primarily fishing enthusiasts, would likely find other recreational locations to temporarily replace reservoir use in the numerous local and regional facilities. There would be some increased use of the most popular locations as Los Vaqueros anglers sought alternative locations; however, this use would be dispersed over a wide geographic area. Representative recreation and open space areas are depicted in Figure 4.15-1 and described the in Regional Recreation Opportunities section above. Other regional options for anglers that would be available during the 5-year restriction of water-related activities in the watershed include: numerous locations in the adjacent Delta region, Contra Loma Regional Park, Del Valle Reservoir, Bethany Reservoir State Recreation Area, San Francisco Bay, and along the San Joaquin River. Since the number of anglers that use the watershed is relatively small and displaced anglers would be dispersed over a wide geographic area, temporary closure of the watershed is not anticipated to cause or accelerate substantial physical deterioration of other local fishing areas.

The recreational visitors to the watershed who do not come to fish would also be displaced during the 3-year project construction period. Due to the steep topography and hot, windy climate associated with the watershed, the existing 55 miles of hiking trails within the watershed are only lightly used during most of the year. Reservoir construction would close trails, restroom and picnic facilities to visitors, and annual athletic events would not be held in the watershed. The displaced recreational visitors would likely use the numerous EBRPD parks, Mount Diablo State Park, and other local parks in the region. Because relatively few recreationalists use Los Vaqueros trails, restroom, and picnic facilities, the temporary and dispersed increase in use of trails and other recreational facilities during project construction is not anticipated to cause or accelerate substantial physical deterioration of other recreational facility.

Additionally, due to the closure of the reservoir during the 3-year construction period, the educational programs would not be offered by CCWD. However, since the number of visitors to the watershed to participate in the educational programs is relatively small and there are a number of other opportunities within the county, including programs offered by state and local agencies, temporary closure of the watershed is not anticipated to cause a substantial physical deterioration of facilities offering educational programs.

Construction of facilities outside the watershed including the new Delta Intake and Pump Station, Delta-Transfer Pipeline, Transfer Facility Expansion, a portion of the Transfer-LV Pipeline, Transfer-Bethany Pipeline, Power Option 1: Western Only and the Western Portion of the Power Option 2: Western & PG&E would not likely increase use of existing regional parks or recreational facilities. Specifically, construction activities associated with the Bethany Reservoir Tie-In would not likely increase use of existing regional parks or recreational facilities as the project area is already restricted from recreational use. Therefore, these facilities would not displace recreational users, causing an increased use of other facilities, nor would they draw additional visitors to nearby recreational facilities.

Summary

Closure of the Los Vaqueros Watershed and of the existing recreational and educational activities within watershed for the 3-year project construction period and additional 2-year restriction for water-related activities would prompt some existing visitors to the watershed to visit other recreation areas in the region while the recreational/educational activities are restricted. Many other recreation areas are available in the project region composed of Contra Costa, Alameda, and San Joaquin Counties that would be able to serve recreation visitors during the short-term displacement from the Los Vaqueros Reservoir.

Alternative fishing opportunities are provided at numerous locations in the adjacent Delta region, Contra Loma Regional Park, Del Valle Reservoir, Bethany Reservoir State Recreation Area, San Francisco Bay, and along the San Joaquin River. Hiking, biking, and picnicking opportunities are provided at numerous parks in the region, including several managed by EBRPD, Mount Diablo State Park and other local and regional parks.

The visitors displaced from the watershed are low in number and would be dispersed in terms of their use of other recreation areas in the region; therefore, implementation of the project under Alternative 1 would not result in a substantial increase in the use of other recreational facilities that would cause or accelerate substantial physical deterioration of facilities. Construction of project facilities outside of the watershed would not displace recreation visitors from existing recreational areas or uses and thus would not cause any increase in recreational use at other facilities. The project effect on other recreational facilities in the project region under Alternative 1 is less than significant.

Alternative 2

Impacts related to the use of existing neighborhood and regional parks and other recreational facilities resulting from construction of the project under Alternative 2 would be the same as analyzed under Alternative 1 because Alternative 2 includes construction of the same facilities as does Alternative 1. Therefore, impacts under Alternative 2 would be less than significant.

Alternative 3

Impacts related to the use of existing neighborhood and regional parks and other recreational facilities resulting from construction of the project discussed under Alternative 3 would generally be the same as analyzed under Alternative 1, since this alternative also includes construction of a 275-TAF reservoir expansion, requiring closure of the watershed for 3 years and an additional 2-year restriction for water-related activities. The Transfer-Bethany Pipeline and the new Delta Intake and Pump Station would not be constructed under this alternative. Alternative 3 does include expansion of the Old River Intake and Pump Station. However, these differences in the facilities to be constructed outside the watershed do not change the overall impact of this alternative on other recreation facilities since none of these facilities would disrupt existing recreation areas or displace recreation users. Impacts under Alternative 3 would be less than significant.

Alternative 4

Impacts related to the use of existing neighborhood and regional parks and other recreational facilities resulting from construction of the project discussed under Alternative 4 would be less than those analyzed under Alternative 1 because the proposed reservoir expansion is 160 TAF rather than 275 TAF and as a result the construction period would be 2 years rather than 3. The watershed and associated recreational opportunities would still need to be closed during the construction period. However, unlike Alternative 1, it is anticipated that not all water-related activities would be restricted during reservoir draw down and subsequent refilling. It is likely that shoreline fishing opportunities would be available and boating may be available depending on the water level retained after draw down. However, as discussed for Alternative 1 this short-term closure of recreational activities and displacement of recreation users from the watershed would not result in a substantial increase in use at other recreational facilities or cause or accelerate facilities deterioration. The following facilities would not be constructed under this alternative: Delta Intake and Pump Station, Delta-Transfer Pipeline, Transfer Facility Expansion, Transfer-LV Pipeline, Transfer-Bethany Pipeline and either power option. Impacts under Alternative 4 would be less than significant.

Summary

Construction of Alternative 4 would not increase the use of other recreational facilities, neighboring parks, or regional parks such that substantial physical deterioration of the facility would occur or be accelerated. Impact to other recreational facilities due to short-term closure of the Los Vaqueros Watershed and its associated recreation activities during the 2-year construction period would be less than significant. Following project construction, the watershed would be re-opened for visitor use of expanded recreation facilities.

Mitigation: None required.

Impact 4.15.3: No other reasonably foreseeable future projects would also reduce recreational opportunities in the project area, similar to those opportunities affected by the project alternatives, or increase the use of existing neighborhood and regional parks or other recreational facilities; therefore, there does not appear to be the potential for the project alternatives to contribute to a cumulative effect on recreation facilities, opportunities or experience. (Less than Significant)

As described under Impact 4.15.1, the project under Alternatives 1, 2, and 3 would result in a short-term reduction of recreational opportunities during the reservoir drawdown, construction and subsequent refilling due to the need to close the Los Vaqueros Watershed and all recreational activities to public use. Alternative 4 would likely not require restriction of all water-related activities during reservoir draw down and refilling. Following completion of project construction, replacement and new recreational facilities would be available in the watershed for public use once more, thus improving recreational opportunities and enhancing recreational experiences. Therefore, potential cumulative effects could only occur if another project would be constructed at the same time as the Los Vaqueros Reservoir Expansion Project and would also reduce fishing, hiking, or picnicking recreational opportunities in the region.

As discussed in Appendix I, Projects Considered for Cumulative Analysis of Land-side Resources and Issue Areas, no other identified development or public works projects are proposed for construction during the same timeframe or in proximity to proposed facility sites. As a result, there does not appear to be the potential for the Los Vaqueros Reservoir Expansion Project construction activities to contribute to cumulative recreational effects. Project construction is anticipated to be completed in about 3 years for Alternatives 1, 2, and 3 and 2 years for Alternative 4, after which there would be no further potential for the project to contribute to cumulative recreational effects associated with construction activities.

Additionally, as described under Impact 4.15.2, due to the closure of the reservoir, some existing visitors to the watershed would be prompted to visit other recreation areas in the region. Therefore, potential cumulative effects could occur if another project would increase the demand for local or regional recreational facilities during the reservoir closure.

As discussed in Appendix I, other identified housing development projects (Pantages Bay at Discovery Bay, Bixler Road Residential Project, Mountain House Specific Plan) would increase the local population and likely the use and potential physical deterioration of local recreational areas during the time the reservoir cannot be used by the public. The Pantages Bay at Discovery Bay and Bixler Road Residential Projects have proposed approximately 290 units and 68 single family residences, respectively. The Mountain House Specific Plan proposes an ultimate population of 39,000 people with anticipated build out occurring around 2024 in a strong economy and around 2044 in a weak economy (Martin, 2008).

Between 2005 and 2008, two and a half neighborhoods were constructed, totaling about 2,500 homes and 5,000 to 7,000 persons. Due to the current economic situation, construction has ceased. Assuming the economy strengthens in the next year, it is reasonably foreseeable that another 2.5 neighborhoods could be completed before the reservoir closure increasing demand for other local or regional recreational facilities. However, as part of the Specific Plan, about 750 acres are proposed for open space and recreation. Therefore, as the population growth from these projects that would overlap with the displacement of recreational uses at the watershed during project construction would be small, the projects would not result in a substantial cumulative increase in the use of other recreational facilities that would cause or accelerate substantial physical deterioration of facilities. Therefore, the projects would not result in a cumulatively considerable contribution to a significant cumulative impact to regional recreational resources.

Mitigation: None required.

4.16 Cultural and Paleontological Resources

This section presents an analysis of potential impacts on cultural resources that would result from implementation of the Los Vaqueros Reservoir Expansion Project pursuant to the requirements of Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (August 2004), the National Environmental Policy Act (NEPA), and the California Environmental Quality Act (CEQA). Additionally, analysis of potential impacts on paleontological resources (i.e., fossils), as required under NEPA is included. The analysis includes a description of the existing conditions, the associated regulatory framework (including all applicable land use policies), the methodology, the significance criteria, the impact assessment, and the mitigation measures for the project alternatives.

Cultural resources are the material remains of past human life or activities. The term encompasses archaeological, traditional, and built environmental resources, including but not necessarily limited to buildings, structures, objects, and sites. Those cultural resources that possess historical significance and therefore require consideration under federal and state laws and regulations are referred to as historical resources (under CEQA) and historic properties (under NEPA and Section 106 of NHPA). Cultural resources is the preferred term that will be used throughout this document except in the contexts in which it is important to indicate that specific cultural resources are significant and have been listed, or are eligible for listing, on the California Register of Historical Resources (CRHR) and/or the National Register of Historic Places (NRHP).

4.16.1 Affected Environment

Regulatory Setting

The project is subject to both state and federal regulations. CCWD is the lead state agency for the project and Reclamation is the lead federal agency. Cultural resource studies have been conducted in compliance with Section 106 of NHPA, NEPA and CEQA.

Federal, State, and Local

National Historic Preservation Act

Section 106 of NHPA and its implementing regulations (36 CFR 800, as amended in August 2004) require federal agencies to consider the effects of their undertakings, or those they fund or permit on historic properties, cultural resources that may be eligible for listing, or that are listed in the NRHP. The 36 CFR Part 60.4 regulations describe the criteria to evaluate cultural resources for inclusion in the NRHP. Such resources are required to retain integrity and must exhibit an association with broad patterns of our history, be associated with an important person, embody a distinctive characteristic, or yield information important to prehistory or history.

The 36 CFR Part 800 regulations, implementing Section 106 of the NHPA, call for considerable consultation with the State Historic Preservation Officer (SHPO), Indian tribes, and interested members of the public throughout the process. If it is determined that the proposed action is the type that has the potential to affect historic resources, the four principal steps are:

- Determine what the area of potential effects (APE) is for the proposed action
- Identify historic properties within the APE
- Assess the affects of the undertaking to historic properties within the APE
- Resolve adverse effects to historic properties adversely affected by the proposed action

Adverse effects to historic properties may be resolved through preparation of a memorandum of agreement (MOA) developed in consultation between interested parties; in the case of the Los Vaqueros Reservoir Expansion Project, this would be Reclamation, SHPO, Indian tribes, and interested members of the public. The Advisory Council on Historic Preservation (ACHP) is also invited to participate. The MOA describes stipulations that treat historic properties to mitigate adverse effects.

National Register of Historic Places

The NRHP, created under NHPA, is the federal list of cultural resources worthy of preservation. Resources listed in the NRHP include districts, sites, buildings, structures, and objects that are significant in American history, prehistory, architecture, archaeology, engineering, and culture. The NRHP is maintained by the keeper of the National Register with the National Park Service (NPS). To guide the selection of properties included in the NRHP, the NPS developed the National Register Criteria for Evaluation located at 36 CFR Part 60.4. The criteria are standards by which every property that is nominated to the NRHP is judged. The quality of significance in American history, prehistory, architecture, archaeology, and culture is possible in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, material, workmanship, feeling, and association, and meet one of the following criteria:

- *Criterion A*: A property is associated with events that have made significant contributions to the broad patterns of the history of the United States
- *Criterion B*: A property is associated with the lives of people significant in United States history
- *Criterion C*: A property embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic value; or represents a significant and distinguishable entity whose components may lack individual distinction
- *Criterion D*: A property has yielded, or may be likely to yield, information important in prehistory or history (36 CFR Part 60.4)

When a project has been defined and recognized as a federal undertaking, an Evaluation and Request for Determination of Eligibility and Effect shall be submitted by Reclamation to SHPO, and one of three possible Findings of Effect can be made: No Historic Property Affected, No Adverse Effect, or Adverse Effect. ACHP regulations (36 CFR 800.9) define an undertaking as having an *effect* on a historic property when the undertaking may alter the characteristics of the property that qualify the property for inclusion in the NRHP, including alteration of the property's location, setting, or use.

An undertaking may have an *adverse effect* when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

American Indian Religious Freedom Act

The American Indian Religious Freedom Act (AIRFA) of 1978 established "the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions…including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites (P.L. 95-431)."

The Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 and the regulations (43 CFR Part 10) that allow for its implementation address the rights of lineal descendants, Indian tribes, and Native Hawaiian organizations (parties with standing) to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony, (cultural items). The statute requires federal agencies and museums to provide information about Native American cultural items to parties with standing and, upon presentation of a valid claim, ensure the item(s) undergo disposition or repatriation.

Native American Heritage Commission

The Native American Heritage Commission (NAHC) identifies and catalogs places of special religious or social significance to Native Americans and known graves and cemeteries of Native Americans on private lands, and performs other duties regarding the preservation and accessibility of sacred sites and burials and the disposition of Native American human remains and burial items.

Paleontological Resources Preservation Act

The federal Paleontological Resources Preservation Act (PRPA) of 2002 was enacted to codify the generally accepted practice of limiting the collection of vertebrate fossils and other rare and scientifically significant fossils to qualified researchers; these researchers must obtain a permit from the appropriate state or federal agency and agree to donate any materials recovered to recognized public institutions, where they will remain accessible to the public and to other researchers (PRPA, 2007). The act also establishes penalties for illegal salvage of paleontological resources on public lands. This act incorporates key findings of a report, *Fossils on Federal Land and Indian Lands*, issued by the Secretary of Interior in 2000 which included input from staff of the Smithsonian Institution, United States Geological Society (USGS), various federal land management agencies, paleontological experts, and the public.

California Environmental Quality Act

Under CEQA, public agencies must consider the effects of their actions on both "historical resources" and "unique archaeological resources." As stated in the Public Resources Code (PRC), Section 21084.1, a "project that may cause substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment."

"Historical resource" is a term with a defined statutory meaning (see PRC, Section 21084.1 and CEQA Guidelines Section 15064.5 (a) and (b)). The term embraces any cultural resource listed in or determined eligible for listing in the CRHR. The CRHR includes resources listed in or formally determined eligible for listing in the NRHP, as well as some California State Landmarks and Points of Historical Interest.

In addition to assessing whether cultural resources potentially affected by a proposed project are listed or have been identified in a survey process, lead agencies have a responsibility to evaluate them against the CRHR criteria prior to making a finding as to a proposed project's impacts on historical resources (PRC, Section 21084.1; CEQA Guidelines, Section 15064.5(a)(3)). In general, a historical resource, under this approach, is defined as any object, building, structure, site, area, place, record, or manuscript that:

a) Is historically or archaeological significant; or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political or cultural annals of California; and

b) Meets any of the following criteria:

   1. Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
   2. Is associated with the lives of persons important in our past;
   3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
   4. Has yielded, or may be likely to yield, information important in prehistory or history.

Potential eligibility also rests upon the integrity of the resource. Integrity is defined as the retention of the resource's physical identity that existed during its period of significance. Integrity is determined through considering the setting, design, workmanship, materials, location, feeling, and association of the resource.

As noted above, CEQA also requires lead agencies to consider whether projects will affect "unique archaeological resources." PRC, Section 21083.2(g) states that "unique archaeological resource" means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

- Has a special and particular quality such as being the oldest of its type or the best available example of its type.

- Is directly associated with a scientifically recognized important prehistoric or historic event or person (PRC, Section 21083.2(g)).

Treatment options under Section 21083.2 of the PRC include activities that preserve such resources in place in an undisturbed state. Other acceptable methods of mitigation under Section 21083.2 include excavation and curation, or study in place without excavation and curation.

California Health and Safety Code

California law protects Native American burials, skeletal remains, and associated grave goods regardless of their antiquity and provides for the sensitive treatment and disposition of those remains. Section 7050.5(b) of the California Health and Safety Code specifies protocol when human remains are discovered. The code states:

> In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27492 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of death, and the recommendations concerning treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code.

CEQA Guidelines Section 15064.5(e) requires that excavation activities be stopped whenever human remains are uncovered and that the county coroner be called in to assess the remains. If the county coroner determines that the remains are those of Native Americans, the NAHC must be contacted within 24 hours. At that time, the lead agency is required to consult with the appropriate Native Americans as identified by the NAHC, who then directs the lead agency (or applicant), under certain circumstances, to develop an agreement with the Native Americans for the treatment and disposition of the remains.

Section 7052 of the California Health and Safety Code states that it is a felony to willfully mutilate, disinter, or remove from a place of interment, any remains known to be human.

California Public Resources Code

Several sections of the California PRC protect paleontological resources. Section 5097.5 prohibits “knowing and willful” excavation, removal, destruction, injury, and defacement of any paleontologic feature on public lands (lands under state, county, city, district, or public authority jurisdiction, or the jurisdiction of a public corporation), except where the agency with jurisdiction has granted permission. Section 30244 requires reasonable mitigation for impacts on paleontological resources that occur as a result of development on public lands. The sections of the California Administrative Code pertaining to the State Division of Beaches and Parks afford protection to geological features and “paleontological materials,” but grant the director of the state park system authority to issue permits for specific activities that may result in damage to such resources, if the activities are in the interest of the state park system and for state park purposes (California Administrative Code Sections 4307–4309; as cited in PRPA, 2007).

If an archaeological resource is neither a unique archaeological nor a historical resource, the effects of the project on that resource shall not be considered a significant effect on the environment. It is sufficient that the resource and the effects on it be noted in the EIR, but the resource need not be considered further in the CEQA process.

Additional sections of the PRC that are applicable to the proposed project are as follows:

- *Section 5097.5*. Provides that any unauthorized removal or destruction of archaeological or paleontological resources on sites located on public lands is a misdemeanor. As used in this section, "public lands" means lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

- *Section 5097.98*. Prohibits obtaining or possessing Native American artifacts or human remains taken from a grave or cairn, and sets penalties for such acts.

Contra Costa County General Plan

The Contra Costa County General Plan includes several goals and policies related to the protection and preservation of cultural resources. Specific policies include the protection of historic buildings or structures (Policy 9-33) and compatibility of development in surrounding areas of historical significance (9-34). These policies are listed in Appendix E-2.

Alameda County East County General Plan

The East County Area Plan also identifies goals and polices pertinent to the preservation of cultural resources. These policies and programs encourage the County to identify and preserve significant archaeological and historical resources (Policy 136), require development to be designed to avoid cultural resources or require appropriate mitigation measures to offset impacts (137); and require a background and records check of a project area if a project is located within a sensitive archaeological zone as determined by the County (Program 59). These policies are described in Appendix E-1.

Contra Costa County Historic Resources Inventory

The Historic Resources Inventory of Contra Costa County, created in 1976 and updated in 1989, was prepared by the Contra Costa County Community Development Department with the assistance of 17 historical societies located within the County. A copy is on file at the California Historical Resources System Northwest Information Center in Rohnert Park, California. This inventory was reviewed for cultural resources within the study area as part of the records search conducted for the proposed project.

Alameda County Register of Historic Resources

Alameda County does not maintain a register for the entire county. Individual cities maintain registers, and the County is developing the Alameda County Register that will list historical resources within the unincorporated areas of the County. To this end the Historical and Cultural Resource Survey of East Alameda County was prepared in 2005 and is available from the County. This survey was reviewed for cultural resources within the study area as part of the records search conducted for the proposed project.

Existing Los Vaqueros Compliance Agreements and Previous Planning Documents

The major cultural resource protection and management documents that were prepared for the construction and operation of the Los Vaqueros Reservoir, associated facilities, and recreation components are listed below. This series of agreement documents and plans stem from compliance with NEPA and, in some cases, with CEQA. Some of these documents may be updated and/or renegotiated for the Los Vaqueros Reservoir Expansion Project.

***Programmatic Agreement* among Reclamation, CCWD, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Implementation of the Los Vaqueros Project (Reclamation, 1992)**

The Programmatic Agreement (PA) is the basis for the protection of historic properties (significant cultural resources) within the APE for the Los Vaqueros Reservoir. The PA stipulates that the project be defined, and that historic properties that would be affected by the project be identified, evaluated, and managed through the development and implementation of Historic Property Treatment Plans (HPTPs). Reclamation served as the lead federal agency for the existing Los Vaqueros Reservoir and was responsible for establishing the PA. CCWD, the lead state agency, is responsible for implementing the PA, which commits CCWD to manage properties deemed eligible for the NRHP within the project APE in a manner consistent with the preservation of these resources. The United States Army Corps of Engineers (USACE) and the State Water Resources Control Board (SWRCB) were the cooperating federal and state agencies, respectively. The SHPO and the ACHP were parties to the agreement. All of the subsequent management documents follow from the PA. Although the existing PA is still in effect, it may be renegotiated among the cooperating agencies, with Reclamation as the lead agency, for the Los Vaqueros Reservoir Expansion Project. If this occurs, Western Power Authority would be included as a signatory.

***Historic Property Treatment Plans* (Sonoma State University Academic Foundation, Inc. (SSUAF), 1993a, 1994, 1995, 1998, 1999, 2001)**

A series of phased HPTPs were created for the Los Vaqueros Reservoir to avoid or minimize project effects on historic properties (SSUAF, 1993a, 1994, 1995, 1998, 1999, 2001). HPTPs are required in accordance with the PA when project plans affect NRHP-eligible cultural resources. The HPTPs detail specific mitigation measures that, when followed, result in a Determination of No Adverse Effect under Section 106 of the NHPA. These measures may protect and conserve sites, or detail the kinds of data recovery and analysis that will be undertaken for those sites subject to adverse effects. Reclamation was responsible for creating the HPTPs, which were reviewed by SHPO. CCWD is responsible for carrying out the HPTPs. In consultation with SHPO, Reclamation would prepare new HPTPs appropriate for the new project effects associated with the proposed project.

***Evaluation, Request for Determination of Eligibility, and Effect for the Los Vaqueros Project*, Alameda and Contra Costa Counties, California (SSUAF, 1992)**

The Los Vaqueros Reservoir Watershed (watershed), located within the upper Kellogg Creek Watershed, was extensively surveyed for cultural resources and the results were presented in the *Evaluation, Request for Determination of Eligibility, and Effect for the Los Vaqueros Project* (Evaluation) (SSUAF, 1992). This effort provided an inventory and evaluation of all cultural resources within the project area known at that time. This effort also served as the basis for consultation by Reclamation with SHPO to determine which properties were eligible for listing on the NRHP; the effect of the project on eligible resources; and procedures for the management and mitigation of effects on the NRHP-eligible cultural resources within the watershed as required by the PA. SHPO's comments or concerns were addressed by Reclamation.

Final Stage 2 Environmental Impact Report/Environmental Impact Statement for the Los Vaqueros Project (CCWD, 1993b)

The results of the Evaluation were presented in the *Final Stage 2 Environmental Impact Report/Environmental Impact Statement* (CCWD, 1993b) in order to satisfy NEPA and CEQA requirements. Mitigation measures identified for cultural resources in the 1993 EIR/EIS are consistent with those included in this EIS/EIR.

Los Vaqueros Cultural Resources Management Plan (Brady/LSA, 1999)

The Cultural Resources Management Plan incorporates and updates the Evaluation (Brady/LSA, 1999) and is presented by CCWD as part of the Resource Management Plan. The Cultural Resources Management Plan summarizes the cultural resources that are eligible for listing on NRHP and details plans for their management. A new Cultural Resources Management Plan may be prepared by CCWD in association with the Los Vaqueros Reservoir Expansion Project.

Memorandum of Understanding Regarding the Respectful Treatment of Native American Graves and Human Remains Discovered During Pre-Construction and Construction of the Los Vaqueros Project (CCWD, 1993a)

The 1993 MOU between CCWD and interested tribal entities of Contra Costa and San Joaquin Counties lays out the roles and responsibilities of all parties during construction and watershed management, and the treatment and disposition of Native American burial sites, funerary objects, and other cultural resources on watershed lands. Reclamation is only involved in such MOUs if and when federally recognized tribal entities have interests in the project area. In this case, although there were several Native American individuals and groups with ties to the project area, none of them belong to federally recognized tribal entities, and thus the 1993 MOU was established by CCWD with no Reclamation involvement. Although the existing MOU remains in effect, CCWD may negotiate a new MOU for the proposed project. This new MOU would continue to include interested tribal entities of Contra Costa County. The project has no components in San Joaquin County, so tribal entities in San Joaquin County would not be included. However, if Alternatives 1 and 2 is to be built (which includes the Transfer-Bethany Pipeline and appurtenant facilities), then the agreement would be extended to include interested tribal entities of Alameda County as there is the potential to discover remains within the proposed pipeline corridor within that county.

Agreement for Curation of Archaeological Collections from the Los Vaqueros Project Area between the Anthropological Studies Center and CCWD (SSUAF, 1993b)

The Curation Agreement details documentation, inventory, and packaging requirements for curated collections; assesses curation fees; and provides curation policies for cultural materials recovered in connection with the Los Vaqueros Reservoir. CCWD is responsible for establishing and following the Curation Agreement and may update the agreement for the Los Vaqueros Reservoir Expansion Project.

Application of Existing Compliance Agreements to the Proposed Project

As the federal lead agency, Reclamation defined the APE and established the PA with SHPO, ACHP, and CCWD as signatories for the Los Vaqueros Reservoir. Reclamation also presented the Evaluation to SHPO for review and addressed any concerns raised by SHPO. That document established how cultural resources would be handled and how they would be affected by the project. CCWD used information from the Evaluation to prepare the 1993 EIR/EIS to comply with CEQA and NEPA, established an MOU and a Curation Agreement, and developed a Cultural Resources Management Plan as part of the Resource Management Plan. Pursuant to the PA, Reclamation oversaw the preparation of a series of HPTPs. Reclamation's responsibility ended once the HPTPs were in place. CCWD remains responsible for carrying out the HPTPs and adhering to the PA. Reports resulting from work done in accordance with these agreement documents are submitted to Reclamation and SHPO for review. To implement the Los Vaqueros Reservoir Expansion Project, Reclamation would prepare a new Evaluation and may negotiate an updated PA, and prepare new HPTPs. CCWD would likely negotiate an updated MOU and Curation Agreement, and develop a new Cultural Resources Management Plan.

Environmental Setting

Cultural resources studies related to the installation and maintenance of the existing Los Vaqueros Reservoir resulted in the documentation of 75 historic properties[1] and one sensitive location[2] within the surrounding watershed. The sensitive location is the reburial site for human remains that were removed from Native American burial sites during construction of the original Los Vaqueros Reservoir. In 1992, the watershed, which comprises the Kellogg Creek Historic District (District), was found to be eligible for listing in the NRHP as a Historic District (SSUAF, 1992). Some of the historic properties are eligible for listing, or are listed on the NRHP as individual properties and as contributors to the District, while others are eligible for listing, or listed, solely as contributors to the District. Properties that are listed individually have significance independent of the District, while those that are listed as contributors to the District derive their significance from their historic role within the District. It is possible for a single property to have both individual significance and significance as a contributor to the District. This EIS/EIR section considers the impact to individual historic properties as well as to the District as a whole.

Area of Potential Effect

An APE is defined in the Code of Federal Regulations (CFR), Title 36, Part 800.16(d) as: "the geographical area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." The APE for the Alternatives 1, 2 and 3 includes the 275 TAF reservoir inundation area plus an additional buffer that encompasses proposed hiking trails, access roads, recreation facilities, and areas subject to indirect effects such as erosion due to fluctuations in the reservoir water level and increased

[1] Any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the NRHP. The term eligible for inclusion in the NRHP pertains to both properties that the Secretary of the Interior has formally determined to be eligible and to all properties that meet NRHP listing criteria.

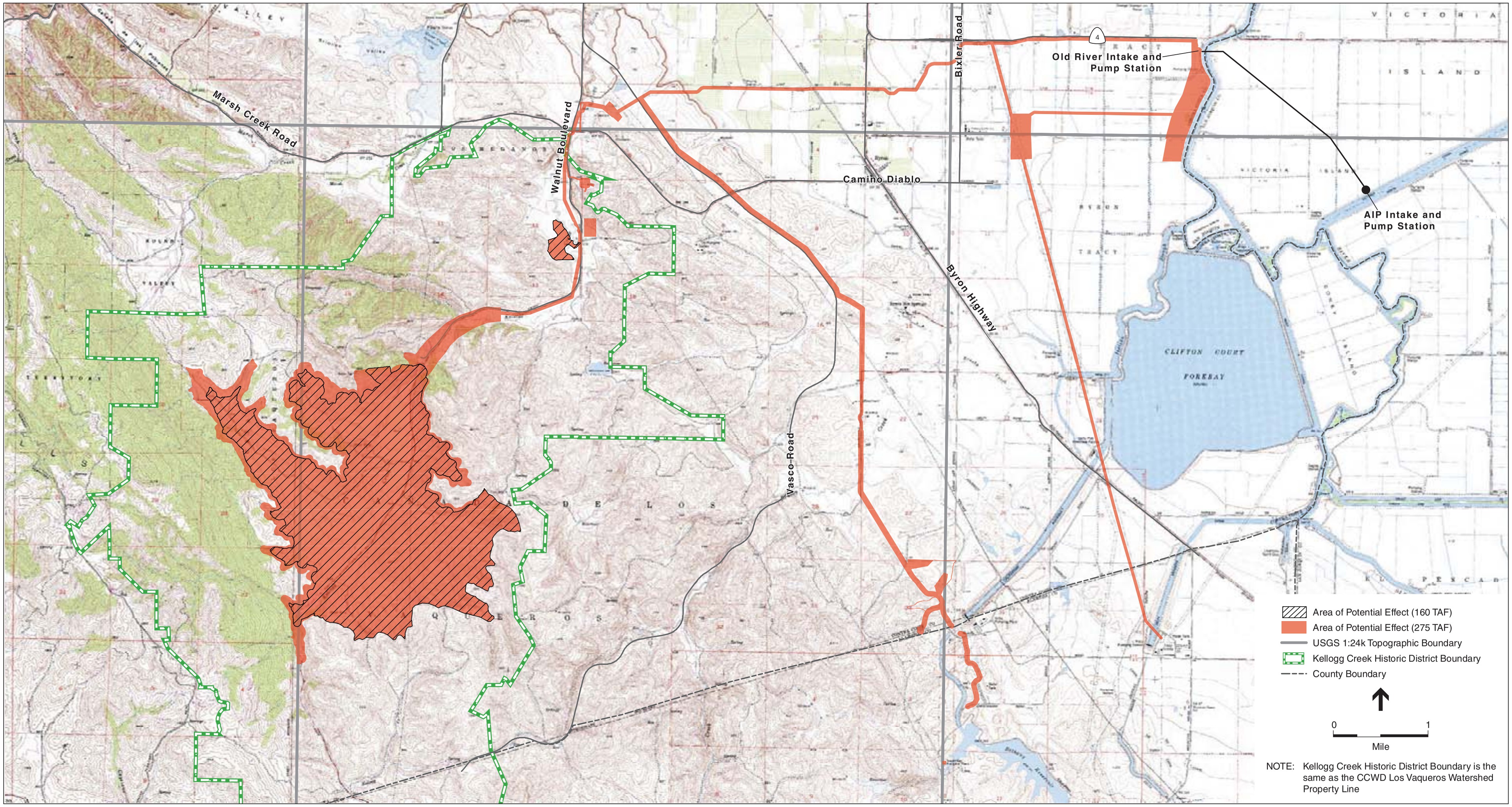
[2] Though not a historic property, this reburial site contains Native American human remains and is subject to legislation guiding the treatment of Native American graves and human remains.

public access (**Figure 4.16-1**). The expansion of the existing dam would also entail the mass excavation of a new foundation upstream of the existing dam foundation to depths of as much as 50 feet below the original ground surface (see Figure 3-2). The APE for the Alternatives 1, 2, and 3 also includes all of the pipeline and electrical power corridors and associated facilities, with the exception of the Transfer-Bethany Pipeline which is not included in Alternative 3. The trench width for the conveyance pipeline installation would range from 35 to 70 feet; trench depth would range from 15 to 55 feet, depending on the size of the pipeline being installed, but would typically be 20 feet. The active work area along the open trench would generally extend about 25 to 50 feet to both sides of the trench. The construction easement analyzed for the proposed pipelines is 200 feet wide, except for the Transfer-Bethany Pipeline for which a construction easement of up to 300 feet wide was analyzed. The actual construction area used would be narrower in some places due to environmental constraints (e.g., to avoid wetlands), physical conditions, or landowner issues. The pipeline construction easement would include temporary access roads, staging areas, and stockpiles (Figure 4.16-1). The corridor width for installation or modification of existing electrical power lines would be 50 feet.

The APE for Alternative 4 includes the 160 TAF reservoir inundation area plus an additional buffer that encompasses proposed hiking trails, access roads, recreation facilities, and areas subject to indirect effects such as erosion due to fluctuations in the reservoir water level and increased public access (Figure 4.16-1). This APE for the 160 TAF reservoir also includes a borrow area northeast of the reservoir and west of Walnut Boulevard. Since Alternative 4 does not include any of the new or expanded facilities outside of the watershed that are included in any of the other three alternatives, therefore the APE for Alternative 4 does not extend outside the CCWD watershed (see Figure 14.16-1). The APE for Alternative 4 is encompassed within the APE for Alternatives 1, 2, and 3.

The APE for Alternative 1, 2, and 3[3] includes 41 historic properties and one sensitive location. The Cultural Resources Technical Report (Appendix G[4]) identifies and evaluates the cultural resources that could be affected by the project alternatives. The maps associated with this document, "Cultural Resource Assessment of the Los Vaqueros Reservoir Expansion Project, Contra Costa County, California" are confidential, and are located, along with the full report, on file at the Northwest Information Center at Sonoma State University. The inundation area of the 275 TAF reservoir, the dam, and the recreation facilities contain 24 of these historic properties and the sensitive location. In addition, geoarchaeological studies have identified areas with a high potential to yield subsurface cultural resources within the District (Meyer, 1996; Meyer and Rosenthal, 1997). These areas are likely to yield prehistoric cultural resources and human burials that have been buried beneath alluvium and are not visible on the modern ground surface. The potential for buried cultural resources in these areas must be considered when evaluating plans for reservoir expansion. Supplemental records searches and pedestrian surveys conducted between 2001 and 2008 indicate that there are 17 historic properties in the proposed pipeline and electrical power corridors and associated facilities. There are no known historic properties in the area proposed

3 There are no historic properties associated with the Transfer-Bethany Pipeline.
4 The full report is only available to federal and State agencies with jurisdiction over cultural resources; a redacted version is included in Appendix G.



SOURCE: USGS Topographic Quadrangles (Antioch South, Brentwood, Tassajara, Byron Hot Springs, Clifton Court Forebay), 1968-1980; Contra Costa County, 2008; MWH, 2008; and ESA, 2008

Figure 4.16-1
Area of Potential Effect

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for expansion or construction of the new Delta Intake and Pump Station facilities adjacent to Old River. These historic properties are discussed in the impact section.

The APE for Alternative 4 includes 15 historic properties and one sensitive location. These are located within the inundation area of the 160 TAF reservoir, the dam, and the recreation facilities. In addition, geoarchaeological studies have identified areas with a high potential to yield subsurface cultural resources within the District (Meyer, 1996; Meyer and Rosenthal, 1997). These areas are likely to yield prehistoric cultural resources and human burials that have been buried beneath alluvium and are not visible on the modern ground surface. The potential for buried cultural resources in these areas must be considered when evaluating plans for reservoir expansion.

Archaeological and Historical Setting

This section provides background information pertinent to the evaluation of cultural resources found in the project area. Los Vaqueros Reservoir is situated in the northern Diablo Ranges along the western edge of the Central Valley and the Sacramento–San Joaquin Delta. The area is composed of a series of low-lying foothills, ranging from 100 feet to 1,100 feet above mean sea level (msl), and northeast-trending valleys that drain into the Central Valley and Delta. Grasslands dominate the lower eastern hills; native grasses were largely supplanted by European varieties with the introduction of cattle and herding into these areas. Oak woodland-savanna with patches of chaparral covers the higher western slopes. Higher-order stream channels host a variety of riparian plant communities (SSUAF, 1992).

The historical Delta region of the Old and Middle Rivers comprises numerous small leveed (reclaimed) islands of tule marshes surrounded by a network of rivers, tributary channels that carry water away from the main river channel, and sloughs (side channels, often dead ends). As a result of farming, levee construction, and canal building, the Delta portion of the study area has been continually disturbed for over 100 years. Elevation ranges from 10 to 14 feet above msl along the elevated levees to below msl in the majority of the Delta region. Today, the area is a mix of nontidal freshwater marsh, seasonal wetlands, upland grassland, and riparian woodland.

The stream channels and associated valley bottoms often harbor prehistoric sites buried beneath sterile alluvium. Because they are not visible on the surface and escape pedestrian survey efforts, these sites—which could contain human burials and be thousands of years old—are most often found by accident during the course of construction projects. In an effort to predict the potential for buried cultural resources, Meyer (1996) conducted a geoarchaeological study of the conveyance corridors associated with Los Vaqueros Reservoir. Meyer analyzed a series of excavated trenches and stream cut banks and identified three successively older buried ancient land surfaces, or paleosols. These paleosols have a high potential of preserving any cultural resources that might have been present when the ancient land surface was exposed and stable. Based on his observations, Meyer developed a predictive model of the relative potential for buried prehistoric cultural resources along the water conveyance system for the original Los Vaqueros Reservoir. His criteria for determining the potential for subsurface cultural resources include the presence or absence of a paleosol buried at some time during the Holocene (the geological period during which humans were present in the area); the degree of preservation or erosion of the surface of a buried paleosol; the time interval of landform stability represented by a paleosol; the presence or absence of a watercourse; and the relative proximity of a buried paleosol to a present or former watercourse (Meyer, 1996). He ranked the potential for buried cultural resources from lacking potential to having low, moderate, or high potential. The predictive model has been substantiated by subsequent archaeological finds (e.g., Meyer and Rosenthal, 1997) and has been used for planning purposes in Section 4.16.2 to develop mitigation measures including avoidance, and pre-construction testing for the purposes of identifying and recording buried cultural resources.

Evidence gathered from recent archaeological investigations conducted by CCWD indicates that the District, defined by the watershed boundaries, experienced one of the longest sequences of human occupation yet identified in a single locality in the broader San Francisco-Bay-Delta region (Meyer and Rosenthal, 1997). The District prehistory includes occupations from the Lower Archaic (10,000 to 6,000 Before Present [BP]), the Middle Archaic (6,000 to 2,500 BP), the Upper Archaic (2,500 to 1,500 BP), the Upper Archaic/Emergent Period transition (1,500 to 700 BP), and the Emergent Period (1,000 to 200 BP).

The earliest occupation of the area during the Lower Archaic is characterized by high residential mobility as evidenced by short-term occupation sites. Grassland-savanna resources such as seeds and nuts were processed using handstones and millingslabs. Obsidian from the North Coast Ranges was imported or obtained in exchange for the production of hunting and processing tools such as knives and spear points. Burials were interred in tightly flexed positions.

During the Middle Archaic, residential mobility had decreased and base camps were established in the valley. Plant resources from the nearby uplands were preferred over the grassland-savanna resources, and mortars and pestles replaced handstones and milling slabs. Burials were placed in flexed and extended positions, sometimes with shell ornaments and beads. Valley occupants continued to obtain obsidian from distant sources.

During the Upper Archaic, fixed villages were established. Plant resources from both the uplands and grassland-savanna were emphasized, with an increased use of small seeds. Numerous uniformly made shell beads and ornaments are often found with flexed burials, indicating both differences in status and the continuing presence of trade and exchange.

During the Upper Archaic/Emergent Period transition, there was a shift in burial practices and land use patterns. Bedrock milling stations were established at least 1,300 years ago, and more locations in the valley were occupied. In contrast to the preceding period, occupations were brief and were probably associated with resource acquisition and processing. Obsidian use increased from earlier periods, but other exchange items were absent. Burials were interred in extended positions.

By the Emergent Period, fixed villages were established, and bedrock-milling stations continued to be used for bulk processing of grassland-savanna small-seed resources in preference over upland nut and berry crops. Obsidian use increased and was associated with the importation of obsidian cobbles and minimally modified flake blanks exclusively from Napa Valley sources.

Extensive research on the probable Emergent Period occupants and their territories within the Los Vaqueros Reservoir area has concluded that precise triblet boundaries cannot be determined (Milliken, as cited in Fredrickson et al., 1997). Mission records indicate that, at the time of the Spanish settlement in California, the Kellogg Creek drainage was near the boundary of two neighboring political groups, the Volvons (speakers of the Bay Miwok language) and the Ssaoams (speakers of the Costanoan/Ohlonean language). The Volvons may have held the peak of Mt. Diablo and the rugged lands to the east of the peak. Their villages were located along the Marsh Creek drainage, and perhaps also at Clayton on the north side of Mt. Diablo or to the southeast in the Kellogg Creek drainage. The Ssaoams lived in the dry hills and tiny valleys around Brushy Peak and Altamont Pass—hilly lands that separated the Livermore Valley from the San Joaquin Valley. They probably held the high lands south and east of Kellogg Creek, including the Vasco Caves. The Ssaoams may have also held the valley of Kellogg Creek itself.

The arrival of the Spanish explorers in 1775 threatened the cultural and political organization of these native groups. The Franciscan priests were intent on changing the native people of California into Catholic agriculturists, which led to a rapid and major reduction in native California populations. The native people living in the Mt. Diablo region (including the present-day Los Vaqueros area) suffered a complete Spanish takeover of their lands by the end of the 18th century. The Spaniards founded Mission San Francisco de Asis (now called Mission Dolores) in 1776, Mission Santa Clara the following year, and Mission San Jose in 1797. Although some native people were drawn to the mission life by their interest in Spanish technology and religion, many were opposed to the Spanish settlement, and most were eventually forced to join the missions or were killed. By 1806, almost all native people were living at the missions, and the surviving Ohlone, along with groups of Esselen, Yokuts, and Miwok, were transformed from hunters and gatherers into agricultural laborers (Levy, 1978; Shoup and Milliken with Brown, 1995). Eventually, increased mortality from new diseases, social stress from disrupted tribal trading networks, and environmental stress caused by growing herds of Spanish livestock served to largely eradicate the aboriginal lifestyle (Fredrickson et al., 1997).

The native population continued to decrease in number following the initial Spanish missionization of the San Francisco Bay Area. Seven missions were eventually established in what was once Ohlone territory, and those natives who were living and working under the authority of the missions were baptized as Catholics. Mission baptismal records indicate “the last Costanoan tribal groups living an aboriginal existence had disappeared by 1810” (Milliken, 1983). By 1832, the population had decreased to less than 20 percent of its size at the time of initial contact with the Spanish (Levy, 1978). Many of the surviving “converted” natives worked as *vaqueros* (cowboys) for the missions and spent much time grazing cattle. At that time, the Los Vaqueros area remained unclaimed and was therefore one of the areas the missions used for cattle ranching.

With the secularization of the missions in the mid-1830s, more than 800 patents of land (comprising more than 12 million acres) were issued to individuals by the Mexican government in what is now California (Ziesing, 1997). Many of the mission lands, including those once used for cattle grazing, were quickly divided up among elite Mexican families, leaving the remaining Indian populations of the former missions with nothing. As a result, many native people migrated back to their homelands and often began working as vaqueros or servants for the new owners of the land.

In the early 1840s, the 17,000-acre Rancho Cañada de los Vaqueros was granted to three brothers-in-law, who used the area only sporadically during their short tenure. Only three surviving Ssaoam descendents and two surviving Volvon siblings were identified in the 1840s mission records, and one or more of these individuals may have been working on the Rancho Cañada de los Vaqueros at that time (Fredrickson et al., 1997). Another suggestion of post-mission Native American settlement was found in an observation made in the 1930s regarding the Suñol Adobe (designated as CA-CCO-45O/H), which lies along the edge of the proposed inundation area. In addition, in 1940 an Indian rancheria was located 1,000 feet up the hill but no other information was identified (Hendry and Bowman, 1940). The settlement referenced by Hendry and Bowman may refer to Native American workers living near the Suñols in the 1850s, or simply to prehistoric archaeological site remains (Meyer and Rosenthal, 1997).

During this period, stock raising was the main economic pursuit at Rancho Cañada de los Vaqueros. The land itself was used only for subsistence-level farming to provide fruits and vegetables for the stockraisers' households (Bramlette et al., 1991). Some domestic structures and corral features were built at this time, but the Rancho Cañada de los Vaqueros area remained sparsely populated.

Deteriorating relations between the United States and Mexico resulted in the Mexican War, which ended with Mexico relinquishing California to the United States under the Treaty of Guadalupe Hidalgo of 1848. The discovery of gold in the Sierra Nevada in 1848 produced a major population increase in Northern California and, although Mexican livestock grants still covered most of the land, immigrants and squatters eventually appeared throughout the area. Land use changes resulted as livestock grazed most native grasses to extinction; woodlands were cut for lumber, railroad ties, and mine timbers; and agricultural development occurred on nearly all arable land.

By the late 1850s, settlers and speculators began investing in the Rancho Cañada de los Vaqueros property (Meyer and Rosenthal, 1997). The validity of various land claims was not resolved by the courts for more than 30 years, and as a result, the Rancho Cañada de los Vaqueros property remained primarily under single ownership. The vast property, which was used for grain farming and ranching, was eventually operated by up to a dozen tenant farmers on parcels of approximately 300 acres each. The land use of this historical period resulted in relatively minimal impacts on cultural resources within the lower watershed, thus preserving much of the material evidence of the past settlement system (Meyer and Rosenthal, 1997).

By the 1870s, the public land on the northern and western edges of the Rancho Cañada de los Vaqueros land grant had been settled by homesteaders. This land was known as the Vasco area (named after a group of Basque cattle ranchers) and was used by the inhabitants for large-scale stockraising and farming. Most of the homesteaders, however, lost their land by the beginning of the 20th century, and small parcels were bought and consolidated for stockraising. The land of the current watershed and surrounding areas remained mostly undeveloped and in the hands of relatively few landowners until plans for a reservoir on this site began taking shape in the 1960s and 1970s (Ziesing, 2000).

Kellogg Creek Historic District

Most significant cultural resources within the watershed now constitute the District. The NRHP defines a "district" as:

> [A] geographically definable area, urban or rural, possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development. A district may also comprise individual elements separated geographically but linked by association or history (NPS, 2005).

This district encompasses both archaeological and architectural historic properties from the prehistoric, ethnohistoric, and historic periods. The SSUAF, Inc., author of the Evaluation, Request for Determination of Eligibility, and Effect for the original Los Vaqueros Project, stated that "While the determination of continuous occupation awaits further investigation, these resources appear to be linked because they illustrate settlement and subsistence patterns through time within an intermediate zone situated between the Delta/Sacramento Valley, San Francisco Bay Area, and the Coast Ranges" (SSUAF, 1992). In addition to discussing continuous occupation, the SSUAF based its assessment on physiographic features, historic land-holding boundaries, and establishment of a district as a management tool (SSUAF, 1992), and recommended the inclusion of 68 historic properties comprising 69 cultural components within this district. The prehistoric period is represented by 12 open sites, 16 milling stations, 8 rock shelters, and 1 rock art site. A ranch site represents the ethnohistoric period, and the historic period includes 1 ancillary farm or ranch complex, 1 water management feature, 5 stone fences and corrals, 23 farm or ranch headquarters, and 1 site of unknown characteristics (SSUAF, 1992). In addition to these, 2 prehistoric milling stations and 5 water management features recorded by Ziesing in 2000 are considered eligible for NRHP district status, bringing the total of historic properties within this district to 75.

Expected Property Types

Prehistoric property types typically found in the District and in the lands to the east (west of the Delta) include but are not limited to the following generalized types:

- **Open Sites** exhibit prehistoric deposits that may or may not be visible on the surface. These sites have an open setting, often with an overview of valley lands. They may include other features such as burials and/or milling stations. The deposits include concentrations of debitage (sharp-edged waste material left over from the creation of stone tools), fire-affected rock, burned and unburned animal bone, and/or shell; this combination of materials is associated with domestic activities. Open sites may also be called occupation sites. Open sites with less diverse materials may represent special-purpose stations.

- **Human Burial Sites** are marked predominantly by the presence of human remains. Other features and associated buried deposits may also be present in the area because human burials are often associated with occupation sites.

- **Milling Stations** are marked predominantly by the presence of bedrock mortars (bedrock milling stations). Such sites may also contain prehistoric cultural materials, such as concentrations of debitage, fire-affected rock, burned and unburned animal bone, and/or shell, or other rock features, but they may also lack associated deposits.

- **Rockshelters** are often found in large rock outcrops and may contain other associated features such as prehistoric cultural materials including concentrations of debitage, fire-affected rock, burned and unburned animal bone, and/or shell, bedrock milling stations, or rock art.
- **Lithic Scatters** are concentrations of materials such as obsidian or chert that represent the remains of stone tool production. This property type typically lacks other cultural materials or features.
- **Rock Art**, painting, pecking, or engraving on rock faces are sometimes found in association with other elements such as bedrock mortars, midden (refuse heap), rockshelters, and subsurface deposits. The rock faces may be isolated or grouped boulders or rock shelter interiors. Painting on rock surfaces in central California is both a rare occurrence and highly susceptible to and easily degraded by vandalism.

Historic property types commonly encountered in the District but also found in the lands to the east (west of the Delta) include but are not limited to the following:

- **Ranch or Farm Headquarters** include ranching or farming structures as well as domestic features. These may include living quarters, privies, cisterns, barns, corrals, other structural remains, non-native vegetation, roads, and fences.
- **Ancillary Ranch or Farm Complex** includes the presence of one or more ranching or farming structures as well as domestic features. These may include living quarters, privies, cisterns, barns, corrals, other structural remains, non-native vegetation, roads, and fences suggesting temporary domestic occupation associated with some animal management feature, such as a corral.
- **Livestock Features** are built elements used for the maintenance of livestock. They include stone and wood corrals and fences.
- **Water Management Features** are built elements used for the storage of water or the manipulation of water sources. They include dams, reservoirs, spring improvements, ditches, creek improvements, and troughs.
- **Historic Artifact Scatters** are defined by debris and refuse concentrations and caches from the historic period characterized by materials such as glass (e.g., fragments of window pane, bottles, or insulators), ceramics (e.g., table ware or storage containers), metal (e.g., wire, nails, or farm equipment), brick, and/or wood. They are represented solely by the presence of such deposits and do not include any structural remains, standing or collapsed.

Paleontological Setting

Paleontological resources within the study area consist of the fossilized remains of plants and animals, including vertebrates (animals with backbones), invertebrates (e.g., starfish, clams, ammonites, and coral marine), and fossils of microscopic plants and animals (microfossils). The age and abundance of fossils depend on the location, topographic setting, and particular geologic formation in which they are found. Fossil discoveries not only provide a historic record of past plant and animal life, but may assist geologists in dating rock formations. Often, fossil discoveries constrain the time period and the geographic range of flora or fauna. The Society of Vertebrate Paleontology (1995) has determined that vertebrate fossils and fossiliferous deposits are considered significant nonrenewable paleontological resources while invertebrate fossils are not significant paleontological resources, *unless* they provide undiscovered taphonomic, taxonomic, phylogenic, ecologic or stratigraphic information. Moreover, certain plant or invertebrate fossils may be designated as significant by a project paleontologist, special interest group, lead agency or local government.

On a regional scale, fossilized plants, animals and microorganisms occur primarily in marine and non-marine (fluvial) sedimentary rock. The potential to preserve fossils in a particular rock formation depends on the depositional environment in which it was formed. For example, fast moving currents that form deposits of gravel and cobbles are less likely to preserve the remains of organisms than gently flowing currents that deposit mud and silt. Thus, the most fossil-bearing geologic units in the APE occur in rocks that formed in relic marine environments such as inland embayments, coastal areas, and extensive inland bays. Over time, these deposits were uplifted and folded, forming the backbone of what is now the Diablo Range. The oldest fossils found in the APE are approximately 100 to 65 million years old (late Cretaceous period), and the youngest are less than 10,000 years old (Holocene period).

Paleontological Sensitivity

To evaluate the paleontological sensitivity of the areas underlying the APE, geologic materials underlying the APE were identified and classified based on the level of evidence indicating the presence of fossils. In order to classify each of the formations for paleontological sensitivity, each source of information was queried for evidence of fossil resources, and sensitivity ratings were assigned based on the results (**Table 4.16-1**).

Overall, the University of California, Museum of Paleontology (UCMP) database lists 2,395 fossil localities in Contra Costa County, of which 270 are vertebrates. In Alameda County, there are 394 fossil localities, of which 96 are vertebrates. Several fossil localities occur along Byron-Kellogg Road, Vasco Road, Marsh Creek, Byron Creek and numerous other unnamed localities (UCMP, 2008). Chevron's database lists approximately 904 microfossils, and Exxon Mobil lists approximately 244 microfossils within the USGS 7.5-minute quadrangles where the project area is located (Woodward Island, Brentwood, Clifton Court Forebay, Byron Hot Springs, Tassajara, and South Antioch). This indicates that the area as a whole is rich in fossil resources.

The majority of fossil discoveries in the UCMP database were invertebrates or microfossils. However, several vertebrate fossils were discovered that may occur in or around the APE, namely within the Tulare, Neroly, and Markley Formations, and the Great Valley Sequence (UCMP, 2008). The database contained vague locality names such as "Delta Pumping Plant," "Byron West 1," and "California Aqueduct 3," so exact locations of these finds could not be determined. The criteria used to assign the various paleontological sensitivities are as follows:

- <u>*Low*</u>: Rock formations that are not identified as fossiliferous in published geologic maps, have no records of fossil discoveries, or are otherwise unlikely to contain fossils due to the age or depositional environment of the formation.

TABLE 4.16-1
PALEONTOLOGIC POTENTIAL OF GEOLOGIC FORMATIONS UNDERLYING THE APE

Rock Formation	Age/Type	Geologic Maps[a]	UCMP Records[b]	Published Literature	Sensitivity Rating
Basin, Natural Levee and Peat Deposits	Holocene/ Stream & Estuarine	No Information	Unknown		Low
Alluvial Fan and Fluvial Deposits	Quaternary/ Non-Marine	Possible fresh-water mollusks/ vertebrates	Unknown		Moderate
Tulare Formation	Pliocene/ Non-Marine	No Information	3		High
Neroly Formation	Miocene/ Non-Marine	No Information	80		Very High
Markley Formation	Eocene/Marine & Non-Marine	No Information	134	Barron et. al., 1984	Very High
Dominigene Formation	Eocene/ Marine & Non-Marine	No Information	92	Barron et. al., 1984	Very High
Meganos Formation	Paleocene/ Marine & Non-Marine	Plant Debris	60	Graham, J.J., 1950	Very High
Great Valley Sequence	Cretaceous/ Marine & Non-Marine	Formaninfera[c]	Unknown		High

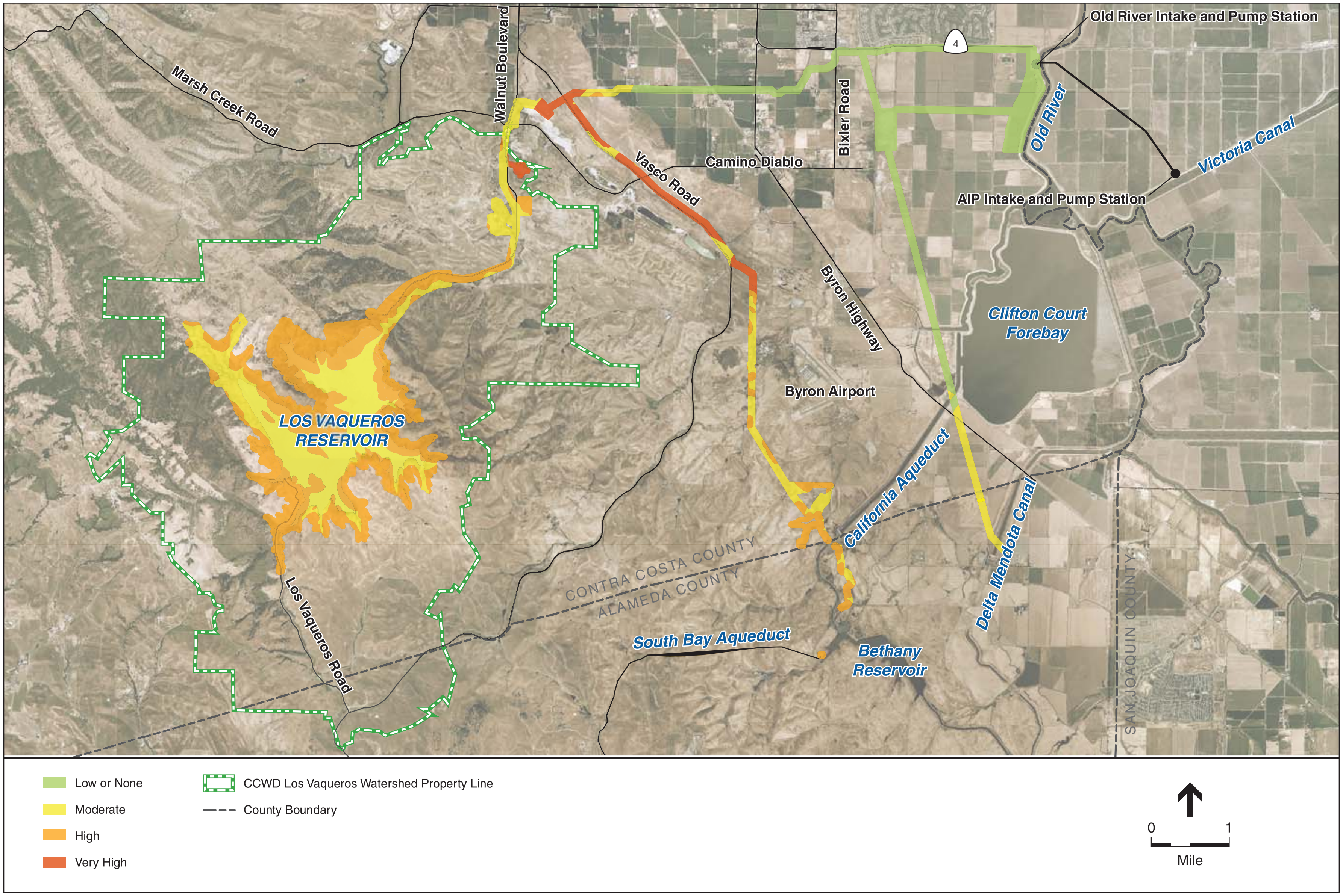
[a] "No Information" means that geologic unit descriptions did not specifically mention the presence of fossils in the rock formation.
[b] The UCMP database was queried for rock formations within Contra Costa and Alameda Counties. "Unknown" indicates that fossils of the same age were found, but there was no information to relate the fossil find to the specific deposit or formation.
[c] Formanifera are small, one-celled, mostly marine animals which secrete shells of calcium carbonate ranging in size from microscopic to a few centimeters across.

SOURCES: Helley and Graymer (1997); Graymer et. al. (1994); UCMP (2008); Barron et. al. (1984); Graham J.J. (1950).

- *Moderate*: Rock formations that are identified as containing fossils in published geologic maps, but where there are no records of fossil finds in the rock formations in the project area.
- *High*: Rock formations that contain numerous records of fossil finds, or few records of vertebrate fossils.
- *Very High*: Rock formations that contain numerous records of vertebrate fossils, or where published literature provides specific information on the significance of fossil finds.

In summary, only the low lying, eastern parts of the APE underlain by peat and basin deposits have a low potential to uncover paleontological resources. The remaining portions of the APE have geologic materials with a moderate to very high potential to uncover paleontological resources (**Figure 4.16-2**). The Neroly, Markley, Dominigene and Meganos Formations were assigned very high sensitivities (Table 4.16-1, above) because of the numerous fossil records found in a search of the UCMP database. In determining the rocks that underlie the APE, an additional 50 meters buffer was added to the APE in order to account for uncertainty in the contacts between rock formations that is inherent in geologic mapping.

Several publications have discussed the presence of fossil resources in the formations that underlie parts of the APE. Graham (1950) describes a scientifically significant discovery of two



SOURCE: Graymer, Jones and Brabb, 1994; Helley and Graymer, 1997; USDA, 2006; UCMP, 2008; and ESA, 2008

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Figure 4.16-2
Paleontological Sensitivity of the APE

Foraminifera microfossils in the uppermost silt member of the Meganos Formation. The Formaniferia species, *Elphidium clarki* and *Operculina campi*, were discovered in augered holes east of Kellogg Creek (SE ¼ SW ¼, Section 6, Township 1 South, Range 3 East on the USGS Byron Hot Springs quadrangle). The discovery of these fossils allowed paleontologists to further describe the geographic range of the species, and the Elphidium fossils may be the oldest of that type in North America (Graham, 1950). Additionally, the Sidney Flat Shale and the Kellogg Shale, both of which occur in the area, are known to contain a wide variety of invertebrate fossils, including foraminifers, coccoliths, silicoflagellates, and diatoms (Barron et. al., 1984). The Sidney Flat Shale is a layer within the Markley Sandstone, and the Kellogg Shale occurs west of Byron. The fossil assemblages have aided geologists in dating the rocks and correlating them with other units in California. The applicability of these discoveries to further understand the geologic record makes this a significant paleontological resource.

Soils

Surface soils lack a burial mechanism to preserve organisms and therefore do not contain paleontological resources. However, a description of their location and depth is important in assessing the potential impact that proposed project components may have on the underlying bedrock. Additional discussion on soils and their occurrence is provided in Section 4.4, Geology, Soils, and Seismicity.

Six soil associations (e.g. different types of soils associated with a common landform such as valleys, ridges, basins, etc.) are found in the project area, all of which are moderately deep to very deep. The Brentwood-Rincon-Zamora association, Capay-Sycamore-Brentwood association, and Sacramento-Omni association occur on valley floors and floodplains. The Marcuse-Solano-Pescadero association forms on the rims of basins. The Rindge-Kingile association occurs on drained mucks in the Delta and is more than 60 inches deep. The Altamont-Diablo-Fontana association, which forms on upland terrain, is classified as moderately deep to deep (Natural Resources Conservation Service (NRCS), 2008). The Sacramento Series is the deepest of these soils, with a depth of 77 inches to bedrock. Generally, the depths to bedrock beneath soils decrease as slopes increase away from valley floors.

Existing Conditions

Existing conditions include historic properties and areas with a high potential to contain as yet undiscovered, buried cultural resources and human remains within the proposed APE. The Cultural Resources Technical Report (Appendix G) contains a detailed and technical exposition of the methods, identification, and evaluation of the cultural resources within the proposed APE, and provides a list of historic properties: those cultural resources evaluated to have historical significance. Methods used to determine the existing conditions for the project include records searches of archaeological, historical, and paleontological resources, application of the geoarchaeological predictive model, and pedestrian surveys. Each of these methods is summarized below.

Records Searches

The cultural resources of the District were studied extensively by CCWD starting in the mid-1980s. The EIR/EIS for the Los Vaqueros Reservoir was certified in 1993, and the reservoir was initially filled with water in 1998. Since then, the cultural resources of the District have been managed and monitored by CCWD staff. In early 2002, CCWD and the consultant team for the project began to thoroughly review all documentation regarding cultural resources in the reservoir expansion area and to verify the locations of selected sites in areas that would be directly affected by reservoir expansion. This environmental evaluation effort was concentrated within the District, although data were also collected for the potential conveyance corridor options in the lands that lie between the reservoir to the west and the Delta to the east.

The staff of the Northwest Information Center (NWIC) of the California Historical Resources Information System conducted records searches October 22, 2001 (NWIC File No. 01-970); October 30, 2003 (NWIC File No. 03-249); January 8, 2004 (NWIC File No. 03-458); March 20, 2007 (NWIC File No. 06-1316) and April 16, 2008 (NWIC File No. 07-1482). Staff transferred locations of known cultural resources and previous cultural resources studies within the study area and adjoining 0.25-mile area from their base maps onto USGS 7.5-minute topographic maps of Brentwood (1978), Byron Hot Springs (1953, photorevised 1968), Clifton Court Forebay (1978), Tassajara (1991), and Woodward Island (1978). The NWIC staff also searched the Office of Historic Preservation (OHP) Historic Properties Directory with archaeological determinations of eligibility (September 18, 2006); the California Inventory of Historical Resources (March 1976); the Historic Resources Inventory of Contra Costa County (1989); and the following historic maps: 1861 Rancho Cañada de los Vaqueros plat map; 1861 Rancho Los Meganos plat map; 1862 General Land Office (GLO) plat maps T1N R2E, T1N R3E, T1S R2E, and T1S R3E; 1871 GLO plat map T2S R2E; Smith & Elliott (publishers) map of Contra Costa County and part of Alameda County (1879); 1898 (reprinted 1947) USGS Mt. Diablo quadrangle; and the 1916 (reprinted 1948) USGS Byron Hot Springs quadrangle.

Geoarchaeological Predictive Model

Meyer (1996) and Meyer and Rosenthal (1997) developed a predictive model using a geoarchaeological study and construction monitoring and excavation results from the original 100 TAF reservoir within the Kellogg Creek Historic District. The map and table provided by Meyer (1996) summarizing the results of the geoarchaeological study identifies the relative potential for buried cultural deposits within the original pipeline corridors for the 100 TAF reservoir. The application of these results to the proposed project APE shows that there is a moderate to high potential for significant, ancient, and deeply buried cultural resources and human remains in the vicinity of the existing dam as well as downstream of the dam in the Kellogg Creek valley parallel to Walnut Boulevard (corresponding to the mid-section of the Transfer-LV Pipeline). The model only applies to the valley floor of the watershed and does not predict the potential for discovery of cultural resources or human remains in the upper elevations of the watershed, in pipeline or power right-of-ways (ROW) outside of the watershed, or at the Delta intake facilities (i.e., Old River and/or new Delta) sites. See **Figure 4.16-3**.

Pedestrian Survey of the Reservoir, Pipeline Corridor, and Associated Facilities

The majority of the APE has been previously surveyed for cultural resources. Additional surveys were conducted for the reservoir expansion area. In April 2004, a selection of cultural resources around the perimeter of the existing reservoir were relocated in the field using a global positioning system (GPS) receiver and mapped using a geographic information system (GIS). The sites were assessed for any unreported disturbance that might have affected their NRHP-eligibility status.

In May, June, and November 2007, and February and April 2008, consultants conducted a mixed strategy pedestrian survey of the reservoir expansion area, the proposed pipeline corridors, the electrical power corridors, and associated facilities. In the reservoir expansion area, surveyors targeted known historic properties between the existing 100 TAF reservoir and the proposed 275 TAF expansion area with an additional buffer of 200 feet. All previously recorded and evaluated sites were relocated and examined for evidence of disturbance. Any new cultural resources were mapped and recorded. Each of the proposed pipeline corridors (Delta-Transfer, Transfer-LV, and Transfer-Bethany), power line corridors, Delta intake sites, and associated facilities that had not been previously surveyed (Transfer Facility expansion area, staging and borrow areas north of the dam) were examined on foot using 4-meter transect intervals. Archaeologists searched for evidence of past cultural activities older than 50 years, including concentrations of flaked stone, groundstone, charcoal, fire-affected rock, locally dark soil, shell and/or bone fragments, shards of ceramic or glass, and other historic-era materials such as brick, nails, wire, foundations, fencerows, and irrigation ditches.

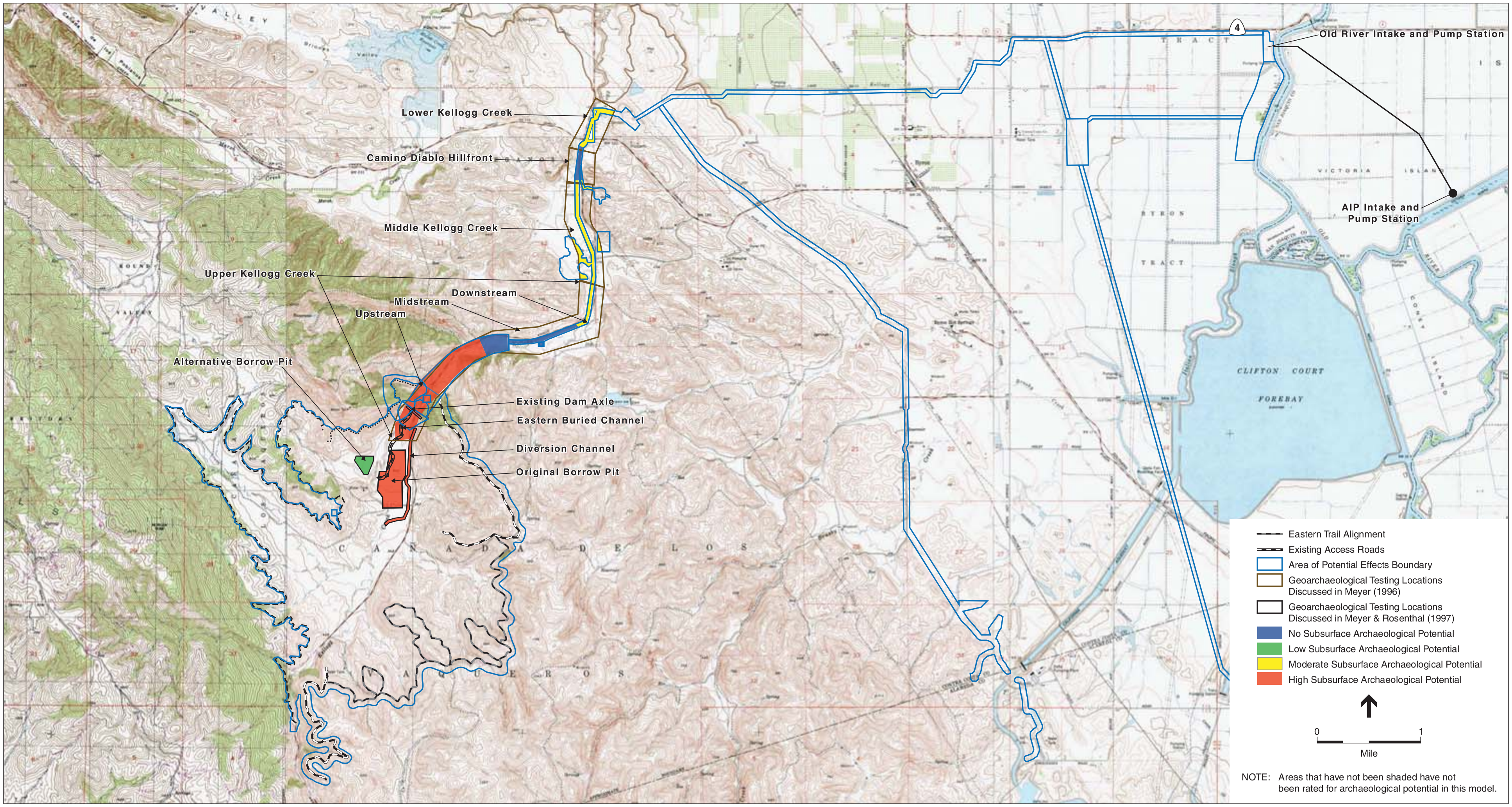
Paleontological Information Sources

In order to describe the paleontological sensitivity of the geologic materials underlying the APE, information was derived from several sources that describe the locations of fossil discoveries and the general nature of geologic deposits.

- *Soil Maps* (NRCS, 2008): Surface soils do not contain paleontological resources due to the lack of a burial mechanism to preserve organisms. However, an evaluation of their location and depth is important in assessing the potential impact that project elements may have on the underlying bedrock. For example, particularly deep soils may protect the underlying geology from disturbance in construction activities.

- *Geologic Maps* (Graymer et. al., 1994; Helley and Graymer, 1997): Geologic maps of bedrock and surficial deposits provide information on the rock formations underlying the APE. The depositional environment of the rock formations underlying a site provides a general idea of whether fossils would be preserved (eg. gentle marine deposits versus a landslide mass). Often, the geologic description of the units identifies those that are fossil bearing.

- *The University of California Museum of Paleontology* (UCMP, 2008): UCMP has the largest paleontological collection of any university museum in the world. Researchers have compiled fossil information from a large number of sources and catalogued them by species, location, age, and the rock formation in which they were discovered. Searching the database by rock formation can give a general idea of how fossiliferous it is. However, detailed locality information is usually unavailable and it can be difficult to find the exact location of a fossil record.



SOURCE: USGS Topographical Quandrangles (Clifton Court Forebay, 1978; Brentwood, 1978; Byron Hot Springs, 1968; Woodward Island, 1978; and Tassajara, 1996); and ESA, 2008

Figure 4.16-3
Geoarchaeological Testing Areas and Areas of Archaeological Sensitivity

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- *Exxon Mobil Corporation and Chevron Corporation Fossil Databases* (Brabb, E.E. and Parker J.M. 2003; Brabb, E.E. 2005): In recent years, Exxon-Mobil and Chevron have released paleontological data on microfossils previously kept confidential. Since the 1930s, petroleum companies have collected microfossils to aid their efforts to determine the age and depositional environments of the formations where these fossils are found. The ability to obtain geographic coordinates or the USGS 7.5 minute quadrangles where the fossils are located provides more detailed location information than the UCMP collections records.

- *Published Literature* (Graham, 1950; Barron et. al., 1984): A literature search was performed using the geologic formations as key words. Several publications were found that discuss the presence of microfossils in formations that underlie the APE. These publications are listed in references for this section.

Summary of Findings

The historic properties and areas of high potential to contain undiscovered cultural resources, as well as paleontological resources, that fall within the proposed APE of the reservoir expansion and associated facilities are summarized in this section and presented by project component. It should be noted, that prior to development of this EIS/EIR, a Facilities Siting exercise was conducted to develop and evaluate potential facility alternatives. Specific siting criteria were developed for cultural resources to determine high, medium, or low constraint based on a defined rating scale resulting in the avoidance of various cultural resources through rerouting or elimination of an alternative route or facility location.

Los Vaqueros Reservoir Expansion

Eighteen known historic properties and one sensitive location (P-07-000532 the Reburial Site) lie within the 275 TAF reservoir portion of the APE. These consist of CA-CCO-9, -427H, -445H, -450/H, -452, -458/H, -459, -462, -463, -464, -467/H, -468, -469, -470H, -636, -696, -725, and P-07-000791. The area has high potential for undiscovered buried cultural resources (including human burials) within the valley floor occupied by the reservoir, and moderate potential in the hillslopes above the valley bottom.

Fifteen known historic properties and one sensitive location (P-07-000532 the Reburial Site) lie within the 160 TAF reservoir portion of the APE. These consist of CA-CCO-9, -427H, -445H, -450/H, -458/H, -459, -462, -463, -468, -469, -470H, -636, -696, -725, and P-07-000791. The area has a high potential for undiscovered buried cultural resources (including human burials) within the valley bottom occupied by the reservoir, and moderate potential in the hillslopes above the valley bottom.

Both the 275 TAF and 160 TAF reservoir APE have a high to moderate potential for paleontological resources.

Dam Modification

Three known historic properties lie within the immediate vicinity of the proposed expanded dam structure for the 275 TAF reservoir expansion: CA-CCO-458/H, -637, and -696. A single historic property, CA-CCO-637, lies within the footprint of the proposed expanded dam structure for the

160 TAF reservoir. There is also a high potential for undiscovered buried cultural resources (including human burials), and high to moderate potential for paleontological resources, in the vicinity of the existing dam.

Borrow Areas

No known historic properties are within the proposed shell borrow areas for the 160 TAF and 275 TAF reservoir alternatives west of the dam. There is a low potential for undiscovered buried cultural resources (including human burials) primarily at the foot of the hills where the borrow area would be placed. However, there is high potential for paleontological resources. There are no known historic properties within the proposed core borrow area for the 160 TAF reservoir alternative west of Walnut Boulevard north of the dam; however, there are two historical properties adjacent to the borrow area, and there is a moderate potential for undiscovered buried cultural resources (including human burials) and paleontological resources. Although testing for the geoarchaeological predictive model did not extend all the way into the proposed borrow area, it is located within the same alluvial valley that was partially tested and yielded a finding of moderate subsurface archaeological potential (Figure 4.16-3).

Staging Area

No known historic properties are within the 15 acre staging area in the northern end of the watershed. The area has low potential for undiscovered buried cultural resources (including human burials), and high to moderate potential for paleontological resources.

Delta Intake Facilities

No known historic properties are within either the Old River Intake and Pump Station Expansion or the new Delta Intake and Pump Station APE. The areas have low potential for undiscovered buried cultural resources (including human burials) and paleontological resources.

Delta-Transfer Pipeline

Nine newly recorded cultural resources were discovered within the Delta-Transfer APE as a result of the records search and field survey. These include four flood control channels (also called irrigation ditches), one irrigation canal, one concrete culvert, one railroad grade, one transmission line, and one water management feature. Because the resources have not been evaluated for their NRHP eligibility, they are assumed to be potentially eligible for listing on the NRHP for the purposes of this analysis, and any impacts to them would be considered significant. All of these resources date from the historic period. However, construction of the Delta-Transfer Pipeline would employ bore and jack technique near these utility crossings, railroad crossings, canal crossings, and would therefore avoid impacts to these known cultural resources. The area has low potential for undiscovered buried cultural resources (including human burials). Regarding paleontological resources, the majority of the alignment has low potential; however, approximately 1 mile of the alignment due east of the Transfer Facility has moderate and very high potential for paleontological resources.

Transfer Facility Expansion

No known historic properties are within the Transfer Facility Expansion APE. The area has low potential for undiscovered buried cultural resources (including human burials) but very high potential for paleontological resources.

Transfer-LV Pipeline

Two historic properties are within the Transfer-LV Pipeline APE, between the Transfer Facility and the Inlet/Outlet Pipeline corridor. These include CA-CCO-397 and -535H. The corridor passes through an area of high potential for encountering as yet undiscovered buried prehistoric resources (Meyer, 1996). There is also high to moderate potential for paleontological resources.

Inlet/Outlet Pipelines

Four known historic properties fall within the Inlet/Outlet Pipeline APE (CA-CCO-446H, -447/H, -726/H, and -755). In the vicinity of the dam, this alignment passes through an area of high potential for encountering as yet undiscovered buried prehistoric resources, including human burials (Meyer, 1996). There is also high to moderate potential for paleontological resources.

Transfer-Bethany Pipeline

Two known historic properties (CA-CCO-596H and -597) are within the Transfer-Bethany Pipeline APE. The area has low potential for undiscovered buried cultural resources (including human burials). There is very high potential, interspersed with areas of moderate potential, for paleontological resources in the northern half of the alignment (i.e., north of where the pipeline begins to traverse along Armstrong Road). Continuing south, there is generally moderate potential, interspersed with high potential until the vicinity of the spoils disposal area, where the potential for paleontological resources generally becomes high, interspersed with moderate potential, until the terminus of the alignment at Bethany Reservoir.

Power Supply

Four known historic properties lie within the portion of the APE for Power Option 1 that is co-located with the Delta-Transfer Pipeline. No known historic properties are within the remainder of the Power Option 1 APE and the entirety of the Power Option 2 APE. Both Power Options have low potential for undiscovered buried cultural resources (including human burials). For Power Option 1, the majority of the project area would have low potential for paleontological resources, except for about 1 mile of the alignment due east of the Transfer Facility which has moderate and very high potential for paleontological resources. For Power Option 2, the Western component from the Tracy Substation to just north of the South Bay Aqueduct would have moderate potential for paleontological resources, while the remainder of the alignment to the intake facilities would have low potential. For the PG&E component, the substation site within the watershed would have very high potential while the alignment to the Transfer Facility would have moderate potential for paleontological resources.

Recreational Facilities

Marina Complex. No known historic properties are within the Marina Complex at the northern end of the reservoir (Alternative 1, 2, and 3), and none on the proposed site on the southern shore of the reservoir (Alternative 4). The facility would be placed within the borrow area west of the dam after removal of the borrow materials and preparation of the remaining ground surface. The area has no potential for undiscovered buried cultural resources (including human burials) because the underlying sediments would be excavated during dam construction (as discussed above for the proposed dam modification), and because the marina construction would not involve additional disturbance of underlying sediments. However, there is high potential for paleontological resources.

Interpretive Center. No known historic properties are within the site proposed for the Interpretive Center (Meyer, 1996). The area has low potential for undiscovered buried cultural resources (including human burials) and high potential for paleontological resources.

Hiking Trails and New Access Roads. The Westside Access Road/Trail associated with Alternatives 1, 2, and 3 would pass through or nearby five known historic properties, including CA-CCO-450/H, -462, -463, -464, and -467/H. The Westside Access Road/Trail associated with Alternative 4 would pass through or nearby six known historic properties including CA-CCO-450/H, -462, -463, -468, -725, and P-07-000791.There is a moderate potential for undiscovered buried cultural resources (including human burials) and a high potential for paleontological resources.

The Eastside Trail would pass nearby two historic properties, including CA-CCO-455 and -456, which would be visible from the trail. There is a low potential for undiscovered buried cultural resources (including human burials) and generally high potential for paleontological resources.

Other Facilities. No known historic properties are associated with other facilities within the Marina Complex for Alternatives 1, 2, and 3, which includes the Fishing Piers, Picnic Areas, Restrooms, Parking and Access Road from Walnut Boulevard. The Alternative 4 potential fishing pier locations at the north end of the reservoir have no known historic properties. The areas associated with these other facilities have low potential for undiscovered buried cultural resources (including human burials) and high potential for paleontological resources.

Relocated Recreational Facilities – Alternative 4 Only. Alternative 1 provides for all recreational facilities to be relocated up slope of their existing locations. The proposed area for relocation of facilities at the southern end of the reservoir have no known historic properties, low potential for undiscovered buried cultural resources, and high potential for paleontological resources.

Impact Mechanisms

The following section considers the potential impact mechanisms on the known historic properties of each component of the project alternatives. All impacts identified for historic properties also apply to the District as a whole, because all historic properties are contributors to the District. The category "district" implicitly recognizes that the importance of the whole is greater than the sum of its contributing parts; the research values of contributing elements in the district can be fully understood only in relation to each other. Thus, invoking the district designation has implications for the treatment of historic properties. By definition, the loss of a single contributing element within an NRHP district has a deleterious impact on the integrity and research potential of the remaining contributing elements and on the district as a whole. Thus, if a project component affects one contributing element of the district, it affects the entire district. Areas of high potential to yield buried cultural deposits are also noted.

The construction and operation of project components could affect historic properties either directly or indirectly. Direct impacts may occur when impacts on historic properties cannot be avoided through project redesign or other methods. Demolition or inundation of historic buildings and excavation of an archaeological site are examples of direct impacts. Historic properties could also be affected indirectly as a result of increased access to the project area that leads to vandalism and unauthorized excavation and collection.

Los Vaqueros Reservoir Expansion / Dam Modification

The construction schedule for the 275 TAF reservoir and dam, described in more detail in Chapter 3, Project Description, includes drawdown of the existing 100 TAF reservoir, a three-year period of construction in which the reservoir will be empty, and subsequent inundation to the 275 TAF level. The impact mechanisms associated with this construction schedule include:

- **Construction period drawdown:** Exposure of currently inundated sites to increased erosion and access could lead to vandalism and illegal collecting.

- **Movement of borrow area materials:** The movement of heavy equipment between the western borrow area and the dam site may cause mixing and crushing of near-surface archaeological deposits.

- **Dam construction:** Mass excavation of a new foundation for the dam expansion would remove materials to the level of bedrock, a depth of greater than 50 feet in some areas. Any archaeological sites would be removed and destroyed. In addition, any additional excavation associated with the new dam would cause ground disturbance and have the potential to directly affect historic properties.

- **Staging:** The use of the staging area downstream of the dam would be limited to the movement and storage of materials, use of contractor trailers and storage bins, and parking. There is a potential for compaction, mixing, and crushing of near-surface cultural resources, if any are present.

- **Inundation:** Prior to inundation, any buildings and structures within the reservoir pool would be demolished; archaeological sites with surface and near surface components would be covered with sediment and water and could be exposed to mixing and crushing. SHPO typically considers inundation to be an adverse effect.

When filled, the reservoir would be subject to periodic fluctuations in water level. The potential impact mechanisms associated with operation and maintenance of the reservoir include:

- **Cultural resources** within the fluctuation zone would be exposed to increased erosion.

- **Access** to historic properties in both the fluctuation zone and sites within a few hundred feet of the water's edge would be increased with maintenance and recreational use, possibly leading to adverse effects from vandalism and illegal collecting.

Old River Intake and Pump Station Expansion

Expansion of this facility, as proposed under Alternative 3 only, would not require any physical site modification. There would be no ground disturbance, changes in site layout or changes to structures required. As a result there would be no physical disruption of the site. The expansion effort involves replacing existing pumps with higher horsepower pumps, replacing steel plates in existing unused bays with state-of-the-art positive-barrier fish screens, and installing a second surge tank in the spot reserved for it next to the existing tank.

New Delta Intake and Pump Station

Construction activities for the new Delta Intake and Pump Station are described in Chapter 3 and in summary would involve the following impact mechanisms:

- **Clearing** and grubbing of the ground.
- **Excavating** and/or pile driving for foundations and utilities trenches.
- **Increased** access and the potential for adverse impacts on historic properties through vandalism and illegal collecting.

Pipelines

Installation of the pipelines is described in detail in Chapter 3 and involves the following potential impact mechanisms:

- **Trenching:** Pipeline installation would remove and destroy any historic properties within the path of the trench to depths of up to 55 feet.

- **Tunneling:** Pipeline installation would remove and destroy any historic properties within the boring pits and the path of the tunnel.

- **Soil Disposal:** Disposal of soils from tunneling would result in the crushing, mixing, and/or compaction of near-surface cultural remains.

- **Temporary access roads, staging, and stockpiling:** Heavy equipment travel, storage, and movement of heavy materials adjacent to the trench and within the 200-foot-wide construction easement (or 300-foot-wide for Transfer-Bethany Pipeline[5]) would result in the crushing, mixing, and/or compaction of near-surface cultural resources and human remains. Any aboveground features, such as petroglyph boulders or bedrock milling stations lying outside of the trench but within the ROW, could be damaged by heavy equipment.

- **Operation and maintenance:** When in place, access roads to the pipelines would increase the potential for adverse impacts on historic properties through vandalism and illegal collecting.

5 The actual construction area used would be narrower in some places due to environmental constraints (e.g., to avoid wetlands), physical conditions, or landowner issues.

Transfer Facility Expansion

Construction activities for the Transfer Facility Expansion are described in Chapter 3 and in summary would involve the following impact mechanisms:

- **Clearing** and grubbing of the ground.
- **Excavating** for foundations and utilities trenches.
- **Increased** access and the potential for adverse impacts on historic properties through vandalism and illegal collecting.

Power Supply

Electrical power facilities could include installation of new power lines, upgrading of existing powerlines, and construction of new substations. Installation of new power/distribution lines would likely involve:

- **Augering** holes for the 50-foot tall poles at up to 300-foot spans.
- **Temporary** 6,250 square feet pull and tension sites within the ROW. Temporary impacts could include crushing, mixing, and/or compaction of near-surface cultural resources and human remains due to use of heavy equipment at the sites.
- **Temporary** access road along the length of the powerline. The temporary access road impacts including clearing and grubbing of the ground, heavy equipment travel along the roadbed, and storage of heavy materials adjacent to the roadbed would result in the crushing, mixing, and/or compaction of near-surface cultural resources and human remains.

Upgrading existing powerlines would involve one of the following:

- **Placing** new insulator arms and additional conductors on existing poles.
- **Pole** for pole replacement of the existing powerline with more powerful transmission line. It would include removal of existing poles, backfill and/or auger of holes, installation of new poles, and removal and replacement of new conductor.
- **Augering** holes for a new set of pole and conductors installed parallel to the existing powerline.

Construction of substations would require approximately 2 acres of land for a permanent fenced facility and a permanent access road. Construction activities would most likely involve:

- **Clearing** and grubbing of the ground.
- **Excavating** for poles and access road.
- **Increased** access and the potential for adverse impacts on historic properties through vandalism and illegal collecting.

Recreation Facilities

Construction, operation, and maintenance of the recreational facilities (e.g., marina, day-use facilities, and parking) would most likely involve:

- **Clearing** and grubbing of the ground.
- **Excavating** and/or pile driving for foundations and utilities trenches.
- **Increased** access and the potential for adverse impacts on historic properties through vandalism and illegal collecting.

Construction of the western access road and hiking trail, and the eastside trail would involve:

- **Clearing**, grubbing, and excavation for the road bed.
- **Temporary** access road construction, staging, and stockpiling. Heavy equipment travel, storage, and movement of heavy materials adjacent to the roadbed would result in the crushing, mixing, and/or compaction of near-surface cultural resources or human remains. Any aboveground features, such as petroglyph boulders or bedrock milling stations lying outside of the trench but within the right-of-way, could be damaged by heavy equipment.

Maintenance and use of the western access road and hiking trail, and the eastside trail would lead to:

- **Increased** access and the potential for adverse impacts on historic properties through vandalism and illegal collecting.

4.16.2 Environmental Consequences

Methodology

The proposed project description was analyzed with reference to the locations and nature of each historic property within the APE. Each anticipated impact (e.g., trenching, earth disturbing activities, etc.) was evaluated with respect to whether it could cause any of the adverse effects listed on any of the historic properties in the previous section, and by extension, on the District as a whole, as all historic properties are contributors to the District. Therefore, if the project alternative impacts one historic property within the District, then impacts to the District as a whole would occur. In addition to historic properties, areas of high potential for buried cultural resources, human remains and paleontological resources are also considered with respect to potential adverse effects. When the following discussion of impacts and significance criteria refers to CEQA, the term historical resource is used to indicate a historically significant cultural resource. When the discussion refers to Section 106 of NHPA, or NEPA, the term historic property is used to indicate a historically significant cultural resource. In the Los Vaqueros Reservoir Expansion Project, all cultural resources that have been determined to be significant under Section 106 of the NHPA are also significant under CEQA (Guidelines Section 15064.5).

Significance Criteria

The project would cause a significant cultural or paleontological resources impact if it would:

- Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5

- Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature
- Disturb any human remains, including those interred outside of formal cemeteries

Under CEQA Guidelines Section 15064.5 and PRC Section 5024.1, all cultural resources that have been listed in or determined eligible for listing in the NRHP (such as the District) are also significant historical resources under California law. A resource that is not federally eligible or listed is still a significant resource under CEQA if it is:

- Determined by the State Historical Resources Commission to be eligible for listing, or listed, in the California Register of Historical Resources;
- Included in a local register of historical resources, as defined in PRC Section 5020.1(k), unless the preponderance of the evidence demonstrates that it is not historically or culturally significant; or
- Determined by the lead agency, on the basis of substantial evidence in light of the whole record, to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California.

Under CEQA, an archaeological resource may be a: 1) historical resource; 2) unique archaeological resource; or 3) non-unique archaeological resource, in descending order of mitigation requirements. All of the historic properties listed or eligible for listing on the NRHP are also listed or eligible for listing on the CRHR. Archaeological resources listed or eligible for listing on the NRHP and the CRHR are historical resources. There are no properties within the APE that are listed in the CRHR but not listed in the NRHP, and no known unique archaeological resources (recognized by CEQA, but not by NHPA) in the project area. Section 15064.5 of the CEQA Guidelines states that a project may have a significant environmental effect if it causes "substantial adverse change" in the significance of a "historical resource" or a "unique archaeological resource," as defined or referenced in CEQA Guidelines Section 15064.5[b, c] (revised October 26, 1998). Such changes include "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of a historical resource would be materially impaired" (CEQA Guidelines 1998 Section 15064.5 [b]).

Under the NHPA Section 106, and for compliance with NEPA, an undertaking may have an *adverse effect* when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:

- Physical destruction or damage to all or part of the property;
- Alteration of a property that is not consistent with the Secretary of Interior's standards for the treatment of historic properties and applicable guidelines;

- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features; and
- Neglect of a property resulting in its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe.

Generally, a project that follows the Secretary of Interior's standards and guidelines for treatment of historic properties shall be considered as mitigated to a level of less than a significant impact on a historical resource for the purposes of CEQA.

Impact Summary

Table 4.16-2 provides a summary of the impact analysis for issues related to cultural and paleontological resources.

TABLE 4.16-2
SUMMARY OF IMPACTS – CULTURAL AND PALEONTOLOGICAL RESOURCES

	Project Alternatives			
Impact	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
4.16.1: Construction and management of project components would cause a substantial adverse change in the significance of a historical and/or unique archaeological resource as defined in Section 15064.5 or historic property or historic district, as defined in Section 106 of the NHPA (36 CFR 800), or in a previously undiscovered cultural resource	LSM	LSM	LSM	LSM
4.16.2: Ground-disturbing activities could encounter and destroy paleontological resources in certain geologic formations underlying the project area	LSM	LSM	LSM	LSM
4.16.3: Construction and management of project components could disturb human remains, including those interred outside of formal cemeteries	LSM	LSM	LSM	LSM
4.16.4: Construction and management of project components would contribute to adverse cumulative impacts to cultural and/or paleontological resources	LSM	LSM	LSM	LSM

NOTES:

SU = Significant and Unavoidable
LSM= Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

Impact Analysis

CEQA terminology is used for consistency and simplification in this section, except where Section 106 of the NHPA is explicitly referenced. The impacts analysis is based on the Cultural Resources Assessment of the Los Vaqueros Reservoir Expansion Project, Alameda and Contra Costa Counties, California (see Appendix G).

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished; therefore no ground-disturbing activities would occur. Consequently, no indirect or direct impacts on cultural or paleontological resources would occur.

Impact 4.16.1: Construction and management of project components would cause a substantial adverse change in the significance of a historical and/or unique archaeological resource as defined in Section 15064.5 or historic property or historic district, as defined in Section 106 of the NHPA (36 CFR 800), or in a previously undiscovered cultural resource. (Less than Significant with Mitigation).

Alternative 1

Los Vaqueros Reservoir Expansion

Eighteen known historical resources and the reburial site (a sensitive site) would be affected by the Los Vaqueros Reservoir Expansion 275 TAF. The potential impacts on each of these resources are summarized in **Table 4.16-3**. The reservoir expansion is located within the watershed, which is listed as a Historic District on the NRHP. All of the historical resources in the watershed that would be impacted by Alternative 1 are contributing elements to this Historic District.

Historical resources that would be significantly impacted include both prehistoric sites and historic sites. The prehistoric occupation and use of the watershed was organized around the location and availability of resources, such as acorns, fresh water, bedrock outcrops, and marshes, among other factors. Many of these resources are located at the lower elevations of the watershed. Expansion of the reservoir would significantly affect an entire class of prehistoric occupation sites. Similarly, the historic occupation of the watershed was in part governed by resource location and setting, and expansion of the reservoir would continue the process begun with the original reservoir that permanently and significantly impacted those historic sites in lower elevations.

The construction schedule includes drawdown of the existing 100 TAF reservoir, a 3-year period in which it would be empty (during dam construction), and inundation to the 275 TAF level. After the reservoir is re-filled, the reservoir would be subject to periodic water level fluctuations. The impacts associated with this construction schedule include the following:

- During construction period drawdown, exposure of currently inundated historical resources to increased erosion and access which could lead to vandalism and illegal collecting.

TABLE 4.16-3
HISTORICAL RESOURCES AND POTENTIAL IMPACTS FROM CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE LOS VAQUEROS RESERVOIR EXPANSION IN THE RESERVOIR ZONE

		Construction	Operation and Maintenance		
Site Number	Property Type	Drawdown	Inundation	Water Level Fluctuation	Access
CA-CCO-9	Milling Station		x	x	x
CA-CCO-427H	Ranch Headquarters	x	x	x	x
CA-CCO-445H	Ranch Headquarters	x	x		
CA-CCO-450/H	Ranch Headquarters Occupation Site	x	x	x	x
CA-CCO-452	Milling Station		x	x	x
CA-CCO-458/H	Occupation Site	x	x		
CA-CCO-459	Milling Station; Burial	x	x	x	x
CA-CCO-462	Milling Station		x	x	x
CA-CCO-463	Occupation Site		x	x	x
CA-CCO-464	Milling Station		x	x	x
CA-CCO-467/H	Milling Station; Water Management Feature		x	x	x
CA-CCO-468	Milling Station; Occupation Site		x	x	x
CA-CCO-469	Milling Station	x	x		
CA-CCO-470H	Ranch Headquarters	x	x		
CA-CCO-636	Occupation Site	x	x		
CA-CCO-696	Buried Site	x	x		
CA-CCO-725[a]	Rock Feature		x	x	x
P-07-000532	Reburial Site	x	x		
P-07-000791	“Spring Box Site” Water Management Feature		x	x	x

[a] The rock feature (CA-CCO-725) was removed and the area was paved over to construct Road 3A during installation of the 100 TAF reservoir. The feature itself no longer exists; however, there is a high potential for additional features and deposits historically associated with the feature in the immediate vicinity.

- During periods when the water levels are highest, some sites could be inundated. Inundation is typically considered an adverse effect.
- As a result of periodic water level fluctuations during normal operation of the reservoir, historical resources within the fluctuation zone would be exposed to increased erosion.
- During operation of the reservoir, increased access to sites in both the fluctuation zone and just beyond the water’s edge could lead to an increased potential for vandalism and illegal collecting.

The drawdown for construction would expose nine currently inundated historical resources (CA-CCO-427H, 445/H, 450/H, -458/H, -459, -469, -470H, -636, -696) and the reburial site P-07-000532) to erosion and the effects of increased access, which could include vandalism and illegal collecting. Some of these sites are extensive and only partially inundated by the 100 TAF reservoir. Inundation of the expanded reservoir to the new 275 TAF level would more fully inundate these (including CA-CCO-427H, 450/H, and -459) and subject three historical resources (CA-CCO-9, -468, and P-01-000791) to inundation for the first time. This inundation would re-submerge those six historical resources that are currently fully inundated (CA-CCO-445/H, -458/H, -469, -470H, -636, -696,) and the reburial site P-07-000532). The drawdown and inundation could also affect undiscovered cultural resources. The archaeological components of CCO-450/H are eligible for listing on the NRHP and CRHR and would be inundated. The buildings at CCO-450/H have been determined to be ineligible for listing on the NRHP or the CRHR and would be demolished prior to inundation. An additional six historical resources (CA-CCO-452, -462, -463, -464, 467/H, and -725) that fall within the 200-foot buffer zone beyond the 275 TAF high water mark (560 feet above msl) along the western side of the reservoir could suffer increased erosion and the effects of increased public access. The 275 TAF reservoir could be drawn down to the same level as the existing conditions. During drawdown, the area between the 100 TAF and the 275 TAF high water marks would be subjected to increased erosion and increased access, which could lead to vandalism and illegal collecting of historical resources. Twelve of the known historical resources listed in Table 4.16-3 would be within the area exposed by periodic lowering of the reservoir level due to seasonal variation in the availability of water (CA-CCO-9, -427H, -450/H, -452, -459,-462, -463, -464, -467/H, -468, -725, and P-07-000791).

Dam Modification

Construction of a new dam could potentially impact three known historical resources within or close to the proposed footprint of the main structure (see **Table 4.16-4**). Although these historical resources (CA-CCO-458/H, -637, and -696) have already been subject to mitigation, there is a high potential that previously undisturbed, significant cultural resources remain at each site and in the vicinity, which has been identified as an area of high potential for buried cultural resources (Meyer and Rosenthal, 1997). Expansion of the dam footprint upstream would require an extended period of drawdown and the mass excavation for a new foundation to a depth of more than 50 feet. The extended drawdown would expose any near-surface remains to erosion, vandalism, and illegal collecting. The mass excavation could remove and destroy any cultural resources or human remains. The movement of heavy equipment and materials could crush, mix, and expose any intact cultural resources remaining at site CA-CCO-458/H upstream of the existing dam structure, and -637 downstream of the existing dam structure, that are not directly removed by mass excavation.

TABLE 4.16-4
KNOWN HISTORICAL RESOURCES AND
POTENTIAL IMPACTS OF CONSTRUCTION OF THE NEW DAM

	Construction			Operation and Maintenance		
Site Number Property Type	Drawdown	Excavation	Crushing	Inundation	Water Level Fluctuation	Access
CA-CCO-696 Buried Site; Burials	x	x	x	x		
CA-CCO-458/H Occupation Site; Burials	x	x	x	x		
CA-CCO-637 Buried Site; Burials		x				

Borrow Area

The borrow area for the 275 TAF dam expansion is located west of the existing dam. No known historical resources fall within the borrow area and there is a low potential for undiscovered cultural resources; however, heavy vehicle traffic between the borrow area and the dam could potentially impact two historical resources (CA-CCO-696 and -458/H) by crushing, mixing and exposing any near-surface cultural resources. This impact is summarized in **Table 4.16-5**.

TABLE 4.16-5
KNOWN HISTORICAL RESOURCES POTENTIALLY IMPACTED BY THE BORROW AREA

Site Number Property Type	Construction Access
CA-CCO-696 Buried Site; Burials	x
CA-CCO-458/H Occupation Site; Burials	x

New Delta Intake and Pump Station

No historical resources and a low potential for undiscovered buried cultural resources are within the APE for the new Delta Intake and Pump Station.

Conveyance Facilities

Construction activities associated with each of the conveyance facilities would generally impact historical resources in the same manner. Earth disturbing activities including trenching to install the pipelines and grading for site preparation could destroy and remove cultural resources. Use of temporary access roads and stockpiles within and adjacent to the construction areas could result in the crushing, mixing, and/or compaction of near-surface cultural resources. Any aboveground features, such as petroglyph boulders or bedrock milling stations within the areas used for temporary access, staging, or storage, could also be damaged by heavy equipment.

Delta-Transfer Pipeline. There are nine newly recorded historical resources within the APE for the Delta-Transfer Pipeline. The pipeline would parallel the existing Old River Pipeline, which was installed by boring under these resources, thereby avoiding impacts. The construction of the Delta-Transfer Pipeline would employ these bore and jack technique near utility crossings, railroad crossings, canal crossings, and would therefore avoid impacts to these known historical resources. There is a low potential for undiscovered buried cultural resources.

Transfer Facility Expansion. No historical resources and low potential for undiscovered buried cultural resources are within the Transfer Facility Expansion APE.

Transfer-LV Pipeline. Two historical resources are within the Transfer-LV Pipeline APE (CA-CCO-397 and -535H) that could be impacted by the installation of the pipeline. This APE meets the APE of the Inlet/Outlet Pipelines which are analyzed separately below. This pipeline passes through areas of no archaeological potential, and through other areas of moderate potential for undiscovered buried cultural resources.

Transfer-Bethany Pipeline. Construction or improvements taking place within the Transfer-Bethany Pipeline APE could potentially impact two historical resources, CA-CCO-596H and -597. There is a low potential for undiscovered buried cultural resources.

Inlet/Outlet Pipelines. The Inlet/Outlet Pipelines APE contains four known historical resources (CA-CCO-446H, -447/H, -726/H, and -755) that could be impacted. The potential impacts on known historical resources are summarized in **Table 4.16-6**. According to the predictive model, there is a high potential for undiscovered cultural resources, including human remains.

TABLE 4.16-6
HISTORICAL RESOURCES AND POTENTIAL IMPACTS FROM CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE RESERVOIR INLET AND OUTLET PIPELINES

	Pipeline Construction		Operation and Maintenance
Site Number **Property Type**	**Excavation**	**Staging and Access**	**Access**
CA-CCO-446H Ranch Headquarters	x	x	x
CA-CCO-447/H Occupation; Livestock Shelter; Burials	x	x	
CA-CCO-726/H Rock Feature; Historic Artifact Scatter	x	x	x
CA-CCO-755 Buried Open Site	x	x	x

Power Supply

Power Option 1: Western Only. Impacts from the portion of the Power Option 1: Western Only transmission line that would be co-aligned with the Delta-Transfer Pipeline are discussed above. Within the APE for the portion of the transmission line that is not co-located with the Delta-Transfer Pipeline alignment, there are no known historical resources and a low potential for undiscovered cultural resources.

Power Option 2: Western & PG&E. Within the APE for Power Option 2, there are no known historical resources and a low potential for undiscovered cultural resources.

Recreational Facilities

Marina Complex. There are no known historical resources and there is low potential for undiscovered buried resources within the APE of the Marina Complex.

Interpretive Center. There are no known historical resources and there is low potential for undiscovered buried cultural resources within the APE of the Interpretive Center.

Hiking Trails.

Westside Hiking Trail/Access Road. Construction of a combined new hiking trail and service road following the western perimeter of the expanded reservoir could impact five historical resources (summarized in **Table 4.16-7**) that are within or immediately adjacent to the construction zone for the trail and service road. Impacts associated with these historical resources would include ground disturbing activities such as clearing and grubbing as well as travel by truck and heavy machinery to and from staging areas during road construction. Each of these historical resources could also be impacted by road operation and maintenance as well as increased access leading to vandalism resulting from the new trail and road. There is a low to moderate potential for undiscovered buried cultural resources.

TABLE 4.16-7
HISTORICAL RESOURCES AND POTENTIAL IMPACTS FROM CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE WESTERN HIKING TRAIL AND ACCESS ROAD

	Road Construction		Road Operation and Maintenance
Site Number Property Type	**Excavation**	**Staging and Access**	**Access**
CA-CCO-450/H Ranch Headquarters; Occupation Site	x	x	x
CA-CCO-462 Milling Station	x	x	x
CA-CCO-463 Occupation Site	x	x	x
CA-CCO-464 Milling Station	x	x	x
CA-CCO-467/H Milling Station; Water Management Feature	x	x	x

Eastside Hiking Trail. A new hiking trail following the eastern perimeter of the expanded reservoir could significantly impact two historical resources, CA-CCO-445 and 456 (summarized in **Table 4.16-8**) that would be visible and accessible from the proposed trail location. Because they would be visible from the new trail, each of these historical resources could be impacted by increased access and vandalism resulting from the new trail. There is a low potential for undiscovered buried cultural resources.

Other Facilities. There are no known historical resources and there is low potential for undiscovered buried cultural resources within the APE of the Fishing Piers, Picnic Areas, Restrooms, Parking, and associated access.

TABLE 4.16-8
HISTORICAL RESOURCES AND POTENTIAL IMPACTS FROM CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE EASTSIDE HIKING TRAIL

	Road Construction		Road Operation and Maintenance
Site Number Property Type	**Excavation**	**Staging and Access**	**Access**
CA-CCO-455 Milling Station			x
CA-CCO-456 Rockshelter			x

Summary of Alternative 1

Alternative 1 has the potential to impact 41 known historical resources, the reburial site, and the District due to construction and/or operation of the following components: Los Vaqueros Reservoir Expansion/Dam Modification (including borrow area), Transfer-LV Pipeline, Inlet/Outlet Pipelines, Transfer-Bethany Pipeline, Power Option 1 or Power Option 2, and both the Westside Access Road/Trail and Eastside Trail. Additionally, there are areas of moderate to high potential for undiscovered cultural resources as well as human remains within the APE for Alternative 1. Therefore, impacts to cultural resources would be significant under Alternative 1.

Alternative 2

Impacts related to historical resources, the reburial site, the District, and previously undiscovered cultural resources resulting from implementation of the project discussed under Alternative 2 would be the same as analyzed under Alternative 1 because Alternative 2 includes implementation of the same facilities as does Alternative 1. Therefore, impacts to cultural resources would be significant.

Alternative 3

Impacts related to historical resources and previously undiscovered cultural resources resulting from implementation of Alternative 3 would be less than Alternative 1 because the Transfer-Bethany Pipeline would not be constructed, thereby reducing the total number of historical resources affected from 41 to 39. However, the impacts to the Kellogg Creek Historic District and historical resources within the District would remain the same as those described for Alternative 1 as a result of expanding the reservoir to 275 TAF. Since the area of ground disturbing activities would be less than under Alternative 1, impacts to previously unidentified cultural resources would be reduced. However, significant areas of moderate to high potential for undiscovered cultural resources within the APE for Alternative 3 remain. In summary, although impacts are reduced, Alternative 3 would still result in significant impacts to cultural resources.

Alternative 4

Impacts related to historical resources and previously undiscovered cultural resources resulting from implementation of Alternative 4 would be less than Alternative 1 because this alternative involves a smaller reservoir expansion (160 TAF only) and several of the project components associated with Alternative 1 would not be implemented under this alternative. The following components would not be constructed: new Delta Intake and Pump Station, Delta-Transfer Pipeline, Transfer Facility Expansion, Transfer-LV Pipeline, Transfer-Bethany Pipeline, Power Supply Options 1 or 2, or the Marina Complex on the northern shoreline. Other project components would be constructed in different locations; for example, the Westside Access Road would be located lower in elevation than proposed under Alternative 1 and recreational facilities would generally be constructed upslope of the existing facilities under Alternative 4 rather than in new locations. Impacts resulting from the Los Vaqueros Reservoir Expansion, Dam Modification, Westside Access Road and relocated recreational facilities associated with Alternative 4 are discussed below:

Los Vaqueros Reservoir Expansion under Alternative 4

The Los Vaqueros Reservoir Expansion to 160 TAF under Alternative 4 would avoid impacts to nine of 18 historical resources potentially impacted under Alternative 1. The nine historical resources which would be impacted under Alternative 4 are summarized in **Table 4.16-9**. Impacts to the reburial site and the District would remain. The construction schedule associated with Alternative 4 would avoid complete drawdown of the existing 100 TAF reservoir, and construction activities would be limited to the downstream side of the dam. After the reservoir is re-filled, the reservoir would be subject to periodic water level fluctuations. The impacts associated with this alternative include the following:

- During periods when the water levels are highest, some sites could be inundated. Inundation is typically considered by SHPO to be an adverse effect.
- As a result of periodic water level fluctuations during normal operation of the reservoir, sites within the fluctuation zone would be exposed to increased erosion.
- During operation of the reservoir, increased access to sites in both the fluctuation zone and just beyond the water’s edge could lead to an increased potential for vandalism and illegal collecting.

Inundation of the expanded reservoir under Alternative 4 would subject six known historical resources (CA-CCO-9, -427H, -450/H, -459, -468, and P-01-000791) to inundation for the first time, or more completely. The archaeological components of CA-CCO-450/H constitute a historical resource, but the building and structures at CCO-450/H have been determined to be ineligible for listing on the NRHP and the CRHR and would be demolished prior to inundation.

An additional three historical resources (CA-CCO-462, -463, and -725) that fall within the 200-foot buffer zone beyond the 160 TAF high water mark (508 feet above msl) and could suffer increased erosion and the effects of increased public access. Seven of the known historical resources listed in Table 4.16-9 would be within the area exposed by periodic lowering of the reservoir level due to seasonal variation in the availability of water (CA-CCO-9, -427H, -450/H, -459, -463, -468, and -725). The 160 TAF reservoir could periodically be drawn down as low as the high water

TABLE 4.16-9
HISTORICAL RESOURCES AND POTENTIAL IMPACTS FROM CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE LOS VAQUEROS RESERVOIR EXPANSION TO 160 TAF IN THE RESERVOIR ZONE

	Construction	Operation and Maintenance		
Site Number **Property Type**	**Drawdown**[b]	**Inundation**	**Water Level Fluctuation**	**Access**
CA-CCO-9 Milling Station		x	x	x
CA-CCO-427H Ranch Headquarters	x	x	x	x
CA-CCO-450/H Ranch Headquarters Occupation Site	x	x	x	x
CA-CCO-459 Milling Station; Burial	x	x	x	x
CA-CCO-462 Milling Station		x	x	x
CA-CCO-463 Occupation Site		x	x	x
CA-CCO-468 Milling Station; Occupation Site		x	x	x
CA-CCO-725[a] Rock Feature		x	x	x
P-07-000532 Reburial Site	x	x		
P-07-000791 “Spring Box Site” Water Management Feature		x	x	x

[a] The rock feature (CA-CCO-725) was removed and the area was paved over to construct Road 3A during installation of the 100 TAF reservoir. The feature itself no longer exists; however, there is a high potential for additional features and deposits historically associated with the feature in the immediate vicinity.
[b] Drawdown is the period when water would be released from the Los Vaqueros Reservoir prior to start of construction.

level of the original 100 TAF reservoir pool. During drawdown, the area between the 100 TAF and the 160 TAF high water marks would be subject to increased erosion and increased access, which could lead to vandalism and illegal collecting of historical resources.

Dam Modification

The Dam Modification under Alternative 4 would avoid impacts to two of the three historical resources associated with Alterative 1. Alternative 4 would require mass excavation for a new foundation to a depth of more than 50 feet upstream of the dam which would remove and destroy any cultural resources or human remains, including those associated with a known historical resource (CA-CCO-637), and any other previously undiscovered cultural resources.

160 TAF Borrow Area

The boundaries of the additional 160 TAF borrow area located near the northern entrance booth has been designed to avoid known historical resources in the vicinity. There is a moderate potential for undiscovered buried cultural resources.

Western Hiking Trail/Access Road

Construction, operation, and maintenance of the Westside Hiking Trail/Access Road under Alternative 4 could impact one more historical resource than would be impacted under Alternative 1. There is a series of six historical resources (summarized in **Table 4.16-10**) that are within or immediately adjacent to the construction zone for the trail/access road. The portions of these sites, some quite extensive, not impacted by construction and road use would be visible and accessible from the trail and road once these are installed and could be impacted by increased visitation and vandalism. Each of these historical resources could be impacted by road building and maintenance as well as increased access resulting from the new trail and road. There is a moderate to high potential for previously undiscovered cultural resources.

TABLE 4.16-10
HISTORICAL RESOURCES AND POTENTIAL IMPACTS FROM CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE WESTERN HIKING TRAIL AND ACCESS ROAD FOR THE 160 TAF RESERVOIR

	Road Construction		Road Operation and Maintenance
Site Number **Property Type**	**Excavation**	**Staging and Access**	**Access**
CA-CCO-450/H Ranch Headquarters; Occupation Site	x	x	x
CA-CCO-459 Milling Station; Burial	x	x	x
CA-CCO-462 Milling Station	x	x	x
CA-CCO-463 Occupation Site	x	x	x
CA-CCO-468 Milling Station	x	x	x
CA-CCO-725 Rock Feature	x	x	x

Relocated Recreational Facilities

No known historical resources, low potential for undiscovered buried cultural resources, and high potential for paleontological resources within the APE for relocated recreational facilities.

Summary

Overall, impacts related to Alternative 4 would be less than Alternative 1. Alternative 4 would potentially affect 15 historical resources, 26 fewer than Alternative 1, as well as the Reburial site and the Kellogg Creek District. Since the area of ground disturbing activities would be less than under Alternative 1, impacts to previously unidentified cultural resources would be reduced. However, there remain significant areas of moderate to high potential for undiscovered cultural resources within the APE for Alternative 4. Therefore, impact to cultural resources would be significant.

Mitigation Measures

Under both federal and state law, the first mitigation measure to be considered for a significant impact to a cultural resource is relocation of project elements so that the impact is avoided. For all project alternatives, some project elements could not be relocated to avoid impacts on cultural resources.

> **Measure 4.16.1a:** ***Los Vaqueros Reservoir Expansion; Dam Modification; and Other Sites Where Cultural Resources Can Be Avoided***. The preferred mitigation measure under CEQA is site avoidance. If feasible, avoid impacts to known cultural resources through project design modification. Using GIS mapping techniques, overlay project design plans on boundary maps of known cultural resources and redesign project components to avoid significant cultural resources by ensuring they fall into areas designated as open space or otherwise undeveloped areas. This is the least costly mitigation measure and is favored by archaeologists, local historical societies, and Native American groups.

> **Measure 4.16.1b:** ***Los Vaqueros Reservoir Expansion; Dam Modification; and Other Sites Where Cultural Resources Cannot Be Avoided***. If feasible, protect cultural resources in place. If resources cannot be protected in place, implement data recovery consistent with 14 CCR § 15126.4(b)(3)(c) and with the guidelines set forth in the Secretary of Interior's standards and guidelines (Standards I through IV). CCR § 15126.4(b)(3)(c) states that a data recovery plan shall be prepared and adopted prior to any excavation being undertaken. Because the historical significance of most archaeological sites lies in their potential to contribute to scientific research, the data recovery plan shall make provision for adequately recovering the scientifically consequential data from and about the historical resource. Similarly geared toward scientific inquiry, the Secretary of Interior's standards include following an explicit statement of objectives and employing methods that respond to needs identified in the planning process; using methods and techniques of archaeological documentation (data recovery) selected to obtain the information required by the statement of objectives; assessing the results of the archaeological documentation against the statement of objectives and integrating them into the planning process; and reporting and making public the results of the archaeological documentation. To this end, data recovery findings shall be documented in a data recovery report, which shall follow guidelines set forth by SHPO for such reports.

> **Measure 4.16.1c:** ***Los Vaqueros Reservoir Expansion; Dam Modification; Marina Access Road; Inlet/Outlet Pipelines; Western Hiking Trail/Access Road; Delta-Transfer Pipeline; Transfer-LV Pipeline; and Transfer-Bethany Pipeline.*** Prior to ground disturbing activities, conduct subsurface investigations (i.e., archeological testing) for undiscovered cultural resources in the portions of the APEs for the project elements that are identified as having

moderate to high potential for undiscovered subsurface cultural resources. Conduct data recovery as described in Mitigation Measure 4.16.1b.

Measure 4.16.1d: ***All project elements near known cultural resources or in areas with high potential for undiscovered cultural resources.*** During construction, restrict ground-disturbing activities to the minimum area feasible and fence off known cultural resources and high-potential areas that are outside but near the construction area. To prevent construction-related adverse impacts on historic properties within the APE, CCWD shall instruct its contractors to place fencing or other barriers around sites that could be affected. CCWD shall prepare and implement a cultural resource construction monitoring plan to ensure that monitoring and/or physical barriers adequately protect sites from incidental construction activities. For example, the petroglyph boulder (CA-CCO-597) that is within the APE for the Transfer-Bethany Pipeline shall be fenced during construction, thereby creating a 20-foot-wide buffer to ensure that heavy equipment traffic and staging- and storage-related activities do not cause inadvertent damage to the property.

Measure 4.16.1e: ***All project elements.*** All construction personnel who work on the project shall undergo a training session to inform them of the presence and nature of cultural resources and human remains within the project area; of the laws protecting these resources and associated penalties; and of the procedures to follow if they discover cultural resources during project-related work.

Measure 4.16.1f: ***All project elements.*** If previously undiscovered cultural resources (e.g., unusual amounts of shell, animal bone, bottle glass, ceramics, structure/building remains, etc.) are discovered during ground-disturbing activities, CCWD shall authorize the construction contractor to stop work in that area and within 100 feet of the find until a qualified archaeologist can assess the significance of the find according to NRHP and CEQA (including CRHR) criteria, and, if necessary, develop appropriate treatment measures in consultation with CCWD. Potential treatment measures for significant and potentially significant resources may include, but would not be limited to, no action (i.e., resources determined not to be significant), avoidance of the resource through changes in construction methods or project design, and implementation of a program of testing and data recovery, in accordance with PRC § 21083.2. Implementation of this mitigation measure would ensure proper identification and treatment of any significant cultural resources uncovered as a result of project-related ground disturbance and would reduce the potential impact resulting from inadvertent damage or destruction of unknown cultural resources during construction to a less-than-significant level.

Measure 4.16.1g: Impacts on some sites from increased access and vandalism can be minimized by updating the existing Cultural Resources Management Plan. The plan was developed for the original Los Vaqueros Project and it should be updated for the proposed project. To ensure the long-term protection of these sites, the existing plan provides guidelines to prevent impacts on historic properties, such as restrictions for use in areas of sensitivity, and a long-term monitoring program to ensure that cultural resources are protected in the future. The plan states that should vandalism be detected during the long-term monitoring program, a plan should be in place to organize the documentation and investigation of the endangered resource. Such an HPTP would entail elements including complete photographic and mapping documentation of the resource, as well as a phased archaeological testing and data recovery program. Such an HPTP shall be developed for each historic property that is determined to be visible from trails, exposure due to erosion, and vulnerable to vandalism for the proposed project.

Measure 4.16.1h: Results from the recordation, testing, and data recovery of the prehistoric and historic-era resources within the District shall be synthesized into a comprehensive scholarly study of the prehistory and history of the District. Particular attention shall be paid to the change in use through time of the lower elevations of the watershed and resources therein within the context of the greater watershed. Additionally, the same information shall be synthesized into a document for public education that can be easily accessed and understood by members of the public including children of grade-school age.

Impact Significance after Mitigation: Less than Significant.

Impact 4.16.2: Ground-disturbing activities could encounter and destroy paleontological resources in certain geologic formations underlying the project area. (Less than Significant with Mitigation)

All Alternatives

Earth disturbing activities, common to all project alternatives, such as trenching, grading, and excavation would disturb the ground below the surface soil horizon and underlying bedrock and could intersect and destroy fossil resources within certain sedimentary formations. As discussed in the paleontological setting section of this chapter, the deepest soils underlying the APE are at approximately 77 inches while hill slope soils are generally significantly shallower. Therefore, since the depth to bedrock associated with the majority of the APE would be less than 6 feet, impacts from any earth disturbing activities could potentially impact paleontological resources. **Table 4.16-11** provides a summary, by project component for each alternative, of the likelihood of impacting paleontological resources.

Because all the project alternatives have the potential to impact paleontological resources; this would be a significant impact.

Mitigation Measures

Measure 4.16.2a: A trained paleontologist shall monitor the earth disturbing activities in areas of high and very high sensitivity. If a paleontological resource is encountered during excavation monitoring, the onsite monitor shall halt or divert excavations within 50 feet of the find until the discovery is examined by the monitor in accordance with Society of Vertebrate Paleontology standards. If the resource is determined not to be significant, construction shall resume. If the resource is determined to be significant, construction shall remain halted and the paleontologist shall prepare and implement a salvage plan in accordance with Society of Vertebrate Paleontology standards to recover, remove and/or mold exposed paleontological resources and conduct sampling where necessary to recover microfossil remains (Society of Vertebrate Paleontology, 1995). The paleontologist shall notify CCWD and Reclamation if the find is determined to be significant.

TABLE 4.16-11
PALEONTOLOGICAL RESOURCES AND POTENTIAL FOR IMPACTS FROM EARTH-DISTURBING ACTIVITIES

Project Component	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Los Vaqueros Reservoir Expansion / Dam Modification	Moderate - High	Moderate - High	Moderate - High	Moderate - High
Delta Intake Facilities	Low - None	Low - None	Low - None	-
Delta-Transfer Pipeline	Low - Very High	Low - Very High	Low - Very High	-
Transfer Facility Expansion	Very High	Very High	Very High	-
Transfer-LV Pipeline	Moderate - Very High	Moderate - Very High	Moderate - Very High	-
Inlet/Outlet Pipelines	Moderate - High	Moderate - High	Moderate - High	Moderate - High
Transfer –Bethany Pipeline	Moderate - Very High	Moderate - Very High	-	-
Power Option 1: Western Only	Low - Very High	Low - Very High	Low - Very High	-
Power Option 2: Western & PG&E	Low - High	Low - High	Low - High	-
Recreation Facilities	Moderate - High	Moderate - High	Moderate - High	Moderate - High

Measure 4.16.2b: Prior to the start of construction on project elements that would require earth disturbing activities in areas of low or moderate paleontological sensitivities, construction personnel involved with earth-moving activities shall be trained regarding the appearance of fossils and proper notification procedures. This worker training shall be prepared and presented by a qualified paleontologist. If workers discover paleontological resources during ground-disturbing activities, work shall stop within 50 feet of the find until a qualified paleontologist can assess the significance of the find and determine the appropriate next steps, depending on the significance of the find as described in Measure 4.16.2a.

Impact Significance after Mitigation: Less than Significant.

Impact 4.16.3: Construction and management of project components could disturb human remains, including those interred outside of formal cemeteries. (Less than Significant with Mitigation)

Alternative 1

Alternative 1 could disturb human remains, including those interred outside of formal cemeteries. The combination of components proposed for this alternative has the potential to impact five known burial sites (CA-CCO-447/H, -458/H, -459, -637, and -696). In addition, the alternative could impact the reburial site (P-07-000532), which houses the human remains previously recovered during the mitigation action for the 100 TAF reservoir. Disturbance of undiscovered human remains could also occur.

Los Vaqueros Reservoir Expansion

Three known burial sites would be potentially impacted by expanding the Los Vaqueros Reservoir to 275 TAF. The potential impacts on each of these properties are summarized in Table 4.16-3. The construction schedule includes drawdown of the existing 100 TAF reservoir, a 3-year period during which the reservoir would be empty (during dam construction), and inundation to the 275 TAF level. After the reservoir is re-filled, it would be subject to periodic water level fluctuations.

The drawdown for construction would expose two formerly inundated known sites with human remains (CA-CCO-696 and -458/H) to erosion and the effects of increased access, including potential vandalism and illegal collecting. Inundation to the 275 TAF level would subject one historical resource with human remains (CA-CCO-459) to complete inundation (the resource is currently partially inundated by the 100 TAF reservoir). This resource is also within an area that would be exposed by periodic lowering of the reservoir level due to seasonal variation in the availability of water. The Los Vaqueros Reservoir Expansion could periodically be drawn down as low as the level of the high water level of the original 100 TAF reservoir. During drawdown, the area between the 100 TAF and the 275 TAF high water marks would be subjected to increased erosion and increased access, which could in turn lead to exposure, vandalism, and illegal collecting of any as-yet undiscovered human remains. The reservoir floor is an area of high potential for previously undiscovered sites with human remains.

Dam Modification

Construction activities associated with the Dam Modification would potentially affect three known burial sites (CA-CCO-696, -637 and -458/H) within or close to the proposed footprint of the main structure (see Table 4.16-4). The potential impacts on each of these properties are summarized in Table 4.16-4. Although all three of these sites within the area of the modified dam (CA-CCO-458/H, -637, and -696) have already been subject to mitigation, there is a high potential that construction activities would impact previously undisturbed human remains as the dam is located in an area that has been identified as having high potential for buried cultural deposits (Meyer and Rosenthal, 1997). Expansion of the dam footprint upstream would require an extended drawdown period and the mass excavation for a new foundation to a depth of more than 50 feet.

The extended drawdown would expose any near-surface remains to erosion, vandalism, and illegal collecting. The mass excavation would remove and destroy any cultural deposits with human remains. Absent mitigation, the movement of heavy equipment and materials could crush, mix, and expose any intact deposits that are not directly removed by mass excavation at site CA-CCO-458/H upstream of the existing dam structure and at CA-CCO-637 downstream of the existing dam structure.

Based on the geoarchaeological study (Meyer, 1996) and the nature of the known sites (Meyer and Rosenthal, 1997), there is a high potential that previously unknown cultural deposits, including human burials, could be disturbed in the area of the proposed new dam (both upstream and downstream) that were not discovered during the previous construction activities.

Borrow Area

No known sites with human remains fall within the borrow area; however, heavy vehicle traffic between the borrow area and the dam could potentially affect two burial sites (CA-CCO-458/H and -696, see Table 4.16-5). The movement of heavy equipment and borrow materials could crush, mix, or expose any near-surface deposits at these two sites. Impacts related to construction access between the borrow area and the dam site is analyzed above under Los Vaqueros Reservoir Expansion and Dam Modification.

Staging Area

The downstream staging area is in an area that has no known burial sites. The anticipated impacts of the staging area would result from the movement and storage of materials, including contractor trailers and parking. Near-surface cultural deposits, if present, could potentially be compacted, mixed, and crushed. Based on the results of the geoarchaeological predictive testing and modeling, however, the area is considered to have moderate potential for undiscovered human remains. During a pedestrian survey, an inspection of the abundant spoils resulting from activities of burrowing animals across the area failed to reveal the presence of any near-surface cultural materials. If present, human remains are likely to be deeply buried and would not be affected by use of the area for construction staging.

New Delta Intake and Pump Station

No known burial sites are within the APE for the new Delta Intake and Pump Station. Therefore, no potential impacts on known sites with human remains are expected. Additionally, there is a low potential for undiscovered human remains.

Conveyance Facilities

Each of the pipeline corridors would affect historical resources with human remains in the same general manner. Trenching to install the pipe would destroy and remove any cultural deposits with burials within the path of the trench. Use of temporary access roads and stockpiles adjacent to the trench would result in the crushing, mixing, and/or compaction of near-surface human remains.

Delta-Transfer Pipeline. No known burial sites are within the APE for the Delta-Transfer Pipeline; therefore, no potential impacts on known sites with human remains are expected. There is a low potential for undiscovered human remains.

Expanded Transfer Facility. No known burial sites are within the APE for the Expanded Transfer Facility; therefore, no potential impacts on known sites with human remains are expected. There is a low potential for undiscovered human remains.

Transfer-LV Pipeline. No known burial sites are within the APE for the Transfer-LV Pipeline; therefore, no potential impacts on known site with human remains are expected. Portions of this proposed pipeline route have a low potential while other portions have a moderate potential for undiscovered human remains (see Figure 4.16-2).

Inlet/Outlet Pipeline. Two known burial sites are (CA-CCO-447/H and CA-CCO-637) within the Inlet/Outlet Pipeline APE. The potential impacts on each of these properties are summarized in Table 4.16-6. Additionally, this is an area of high potential to yield human remains.

Transfer-Bethany Pipeline. No known burial sites are within the APE for the Transfer-Bethany Pipeline; therefore, no potential impacts on known sites with human remains are expected. There is a low potential for undiscovered human remains for the majority of the Transfer-Bethany Pipeline, except where the pipeline approaches within 100 feet of creeks: the potential increases to moderate.

Power Supply

No known burial sites are within the APE for Power Options 1 or 2; therefore, no potential impacts on known sites with human remains are expected. There is a low potential for undiscovered human remains.

Recreational Facilities

No known burial sites are within the APE for the Recreational Facilities; therefore, no potential impacts on known sites with human remains are expected. There is low potential for undiscovered human remains.

Summary

Implementation of Alternative 1 would impact five known burial sites as well as the Reburial site which houses the human remains previously recovered during the mitigation action for the existing Los Vaqueros Reservoir. Furthermore, Alternative 1 proposes ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains. Therefore, impacts to known and previously unrecorded human remains under Alternative 1 would be significant.

Alternative 2

Alternative 2 would result in the same impacts on known human remains and undiscovered human remains as those described for Alternative 1 because Alternative 2 includes implementation of the same facilities as does Alternative 1. Therefore, impacts to known and previously unrecorded human remains would be significant.

Alternative 3

Alternative 3 would result in the same impacts as Alternative 1 on known human remains and the reburial site because the impacts are caused by construction of facilities common to both alternatives (i.e., Los Vaqueros Reservoir Expansion/Dam Modification and Inlet/Outlet Pipelines). Furthermore, Alternative 3 also proposes ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains. Although Alternative 3 would include the Old River Intake and Pump Station Expansion, there are no known burial sites within the APE; therefore, no potential impacts on known sites with human remains are expected. Additionally, there is a low potential for undiscovered human remains. However, overall, impacts to known and previously unrecorded human remains would be significant.

Alternative 4

Alternative 4 would result in no impacts to the reburial site and fewer impacts to known human remains when compared to Alternative 1. Specifically, because Alternative 4 would not require drawdown for construction, two formerly inundated known sites with human remains (CA-CCO-696 and -458/H) would not be exposed. There are no known sites with human remains within the proposed boundaries of the 160 TAF core borrow area to the west of the dam. However, like Alternative 1, CA-CCO-459, a known burial site (historic resource with human remains) would be impacted by expanding the Los Vaqueros Reservoir to 160 TAF. Furthermore, Alternative 4 proposes ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains. While the nature of the impacts on human remains would be equivalent to those from Alternative 1, the extent of impact would be less because there is less earth disturbing activities proposed under Alternative 4. However, impacts to known and previously unrecorded human remains under Alternative 4 would still be significant.

Mitigation Measure

Measure 4.16.3: ***Stop Potentially Damaging Work if Human Remains Are Uncovered During Construction, as a Result of Erosion, or of Vandalism, Assess the Significance of the Find, and Pursue Appropriate Management.*** California law recognizes the need to protect interred human remains, particularly Native American burials and associated items of patrimony, from vandalism and inadvertent destruction. The procedures for the treatment of discovered human remains are contained in California Health and Safety Code §7050.5 and §7052 and California PRC §5097.

In accordance with the California Health and Safety Code, if human remains are uncovered during ground-disturbing activities, including construction, erosion, or vandalism, all such activities within a 100-foot radius of the find shall be halted immediately and CCWD's designated representative shall be notified. CCWD shall immediately notify the county coroner and a qualified professional archaeologist. The coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or state lands (Health and Safety Code Section 7050.5[b]). If death appears to have resulted from homicide, suicide, poisoning, accident, violence, or certain contagious diseases and hazards, the coroner is required to investigate as specified in Government Code Section 27491. If the coroner determines that the remains are those of a Native American, he or she must contact the Native American Heritage Commission by phone within 24 hours of making that determination (Health and Safety Code Section 7050[c]). CCWD's responsibilities for acting upon notification of a discovery of Native American human remains are identified in detail in the California PRC Section 5097.98. CCWD or its appointed representative and the professional archaeologist shall contact the Most Likely Descendent (MLD), as determined by the NAHC, regarding the remains. The MLD, in cooperation with the property owner and the lead agencies, shall determine the ultimate disposition of the remains in accord with the provisions of Section 5097.98. If NAHC cannot identify any MLDs, if the MLD fails to make a recommendation, or CCWD disagrees with the MLDs recommendation and mediation fails to resolve the issue, then CCWD must reinter the human remains with appropriate dignity on a part of the property not subject to further subsurface disturbance, as is specified in Section 5097.98(b) and 14 Cal. Code Regs § 1064.5(e)(2).

Impact Significance after Mitigation: Less than Significant.

Impact 4.16.4: Construction and management of project components would contribute to adverse cumulative impacts to cultural and/or paleontological resources. (Less than Significant with Mitigation)

Cultural Resources

The geographic scope considered for potential cumulative impacts to cultural resources is the District and portions of the project area that would be subject to ground disturbing activities. Outside the watershed, and therefore outside of the District, there are no projects that have the potential to result in similar impacts within the APE of the project alternatives.

Within the watershed, and hence within the District, the proposed Vasco Wind Energy Repowering Project (Wind Project) could contribute to cumulative cultural resource impacts in combination with the proposed project. Approximately one half of the project area associated with the Wind Project would be located within the District. Construction and maintenance activities associated with the Wind Project could impact known historical resources (CCO-448H) and undiscovered cultural resources and/or human remains as a result of activities including installation of wind generation facilities as well as access road construction and maintenance. As previously stated, a District is considered to represent more than the sum of its parts; therefore, any action that significantly impacts one element of the District has the potential to impact the entire District. Therefore, these impacts in combination with the impacts associated with the proposed project would result in a significant cumulative impact to the District. The project's contribution would be cumulatively considerable; however, Measures 14.16.1a-h identified for the Los Vaqueros Reservoir Expansion Project would reduce the project's contribution to a less than cumulatively considerable level.

Impacts to human remains are site specific; therefore, since there are no past, present and reasonably foreseeable actions that would result in the same impact as the project alternatives; no cumulative impact would occur.

Paleontological Resources

The geographic scope considered for paleontological resources consist of areas within the vicinity of the project alternatives that are geologically similar and are likely to contain similar fossil resources. Construction related impacts that would result in ground disturbing activities would have the potential to add to anticipated project impacts, thus causing a cumulatively considerable impact to paleontological resources.

Due to the nature of the fossil record (i.e., buried bedrock), paleontologists cannot know either the quality or quantity of fossils prior to exposure. As a result, even in the absence of surface fossils, it is necessary to assess the sensitivity of rock units based on the known potential to produce significant fossils elsewhere within the same geologic unit, a similar geologic unit, or based on whether the unit in question is deposited in a type of environment that is known to be favorable for fossil preservation.

The Wind Project could also contribute to cumulative paleontological resource impacts in combination with the proposed project. As mapped by Graymer, et al. (1994), the bedrock that underlies the Wind Project area is underlain by Unit B and C of the Great Valley Sequence, common to the proposed project. The sequence is comprised of mostly marine sandstone and shale that is Cretaceous in age (65 to 145 million years old). Construction and maintenance activities associated with the Wind Project could impact these paleontological resources as a result of activities including installation of wind generation facilities, underground cable lines, substation, and access roads. Additionally, the following projects would overlap with geologic units that may contain paleontological resources that would be affected by the proposed project: Vasco Caves to Brushy Peak Trail (Unit C of the Great Valley Sequence), DWR South Bay Aqueduct (SBA) Enlargement (Unit D of the Great Valley Sequence), Vasco Road Safety Improvements (A and B) (Unit B and C of the Great Valley Sequence), Vasco Road and Camino Diablo Intersection Improvements Project (Undivided Flatland), and Marsh Creek Road Shoulder Widening Project sites (Unit D of the Great Valley Sequence). These projects are in areas where there could be a high to very high paleontological sensitivity.

Therefore, these impacts in combination with the impacts associated with the proposed project would result in a significant cumulative impact to paleontological resource. However, cumulative impacts on paleontological resources result when rock units become unavailable for study and observation by scientists. The destruction of fossils has a significant cumulative impact as it makes biological records of ancient life unavailable for study by scientists. The projects contribution would be cumulatively considerable; however Mitigation Measures 4.16.2a and 4.16.2b, which requires preparation and implement of a salvage plan in accordance with Society of Vertebrate Paleontology standards for paleontological resources that are exposed during ground disturbing activities and are determined to be significant, identified for the Los Vaqueros Reservoir Expansion Project would reduce the projects contribution to a less than cumulatively considerable level.

Mitigation Measure

Measures 4.16.2a and 4.16.2b, as previously stated.

Impact Significance after Mitigation: Less than Significant.

4.17 Socioeconomic Effects

This section provides an analysis of the potential socioeconomic impacts that would result from implementation of the Los Vaqueros Reservoir Expansion Project. The section includes a description of the existing conditions, the associated regulatory framework (including all applicable socioeconomic policies), impact assessment methodology, and an assessment of impacts.

4.17.1 Affected Environment

Regulatory Setting

Federal

National Environmental Policy Act

According to the provisions of the National Environmental Policy Act (Title 40, Code of Federal Regulations, Section 1508.14):

> "…economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment."

State

California Environmental Quality Act

Under the California Environmental Quality Act (CEQA) Guidelines (Section 15358[b]), the impacts analyzed in an Environmental Impact Report (EIR) must be "related to physical changes" in the environment. The CEQA Guidelines (Section 15131[a]) states, "Economic or social effects of a project shall not be treated as significant effects on the environment." In some cases, however, economic effects can result in physical effects. Therefore guidelines also state:

> An EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes resulting from the project to physical changes caused in turn by the economic or social changes. The intermediate economic or social changes caused need not be analyzed in any detail greater than necessary to trace the chain of cause and effect. The focus of the analysis shall be on the physical changes.

Local

Contra Costa County General Plan

The Contra Costa County General Plan does not identify goals, policies, and implementation measures related to the social or economic effects of the project alternatives.

Alameda County General Plan

The Alameda County General Plan does not identify goals, policies, and implementation measures related to the social or economic effects of the project alternatives.

Socioeconomic Conditions

The proposed project facility sites are located in eastern Contra Costa County and adjoining Alameda County. Because the majority of facilities would be located in the eastern part of Contra Costa County, this county represents the primary affected environment for the socioeconomic impact analysis. In addition, Contra Costa County also encompasses the Contra Costa Water District (CCWD) service area boundaries and is the location of several communities that would contribute goods and services to the construction activities. Furthermore, focusing the impact analysis on this affected environment will ensure an assessment that is more conservative than would be obtained using a broader regional approach in which any effects would be dispersed over a greater area. For the purpose of this analysis, it is expected that about 40 percent of the construction employees would be county residents; the remaining 60 percent would travel to the area, depending on the contractor selected and range of construction capabilities they would bring to the project.

Table 4.17-1 presents the existing (baseline) economic conditions for each of the major industrial sectors within Contra Costa County. The services sector is by far the county's primary employment sector, providing over 43 percent of the jobs—more than three times the size of the next largest sector (Financial, Investment, and Real Estate). However, in terms of output, manufacturing industries produce more than twice the contribution to the county's economy, despite having only a ninth of the employees.

TABLE 4.17-1
ANNUAL JOBS AND OUTPUT BY SECTOR – CONTRA COSTA COUNTY (2004)

Industry Sector	Jobs	Output (in millions of 2008 dollars terms)
Agriculture	2,796	$1,340
Construction	46,518	$7,481
Manufacturing	24,398	$44,782
Transportation, Communications, and Public Utilities	32,695	$12,319
Trade	63,121	$7,091
Financial, Investment, and Real Estate	67,310	$16,574
Services	217,361	$19,684
Government	45,719	$8,837
TOTAL	**499,918**	**$118,108**

SOURCES: MIG, 2007.

The western and northern area shorelines of Contra Costa County are highly industrialized, while the interior sections of the western part of the county are predominantly residential, commercial, and light industrial. Most of the county's employment and residential population is located in the western parts of the county, while the eastern areas in the project vicinity are relatively rural. Agriculture, service, and some construction employment provide most of the job opportunities for residents in the eastern part of the county. However, in recent years, considerable growth in residential development along the northern and northeastern county areas has occurred.

Table 4.17-2 presents Contra Costa County's population and unemployment figures. While the county has a relatively high rate of employment among its residents, there were an estimated 24,900 unemployed residents in 2007.

TABLE 4.17-2
CURRENT POPULATION AND UNEMPLOYMENT IN CONTRA COSTA COUNTY (2007)

Industry Sector	Contra Costa County	California
Total Population	1,042,321	37,662,518
Total Labor Force	526,100	18,188,100
Total Employment	501,200	17,208,900
Unemployment Rate	4.7%	5.4%

SOURCES: DOF, 2007; EDD, 2007.

4.17.2 Environmental Consequences

Methodology

The socioeconomic analysis of the proposed Los Vaqueros Reservoir Expansion Project evaluates potential economic changes resulting from project construction activities using an economic model, IMPLAN, which is described below. The analysis focuses on the potential construction related socioeconomic effects since this aspect of the project involves the greatest opportunity for mobilization and re-allocation of money, such that construction is expected to financially affect individuals and businesses within the local economy. This section also provides a quantitative assessment of potential project-related land use changes (i.e., temporary and long-term impacts on agriculture) and other local revenue-generation activities (i.e., recreation). Economic assessment of changes to agriculture and recreation involve a limited time period (approximately 3 year construction period) and relatively small amounts of money when compared with construction costs, and therefore spending related to these activities was not modeled in the same manner as construction costs.

Construction cost estimates for Alternative 1 were used to evaluate economic impacts for project construction. Because the facilities to be constructed are the same, Alternative 2 is expected to cost the same as Alternative 1. Cost estimates for Alternative 3 and Alternative 4 were not available at the time of EIS/EIR preparation, however since Alternative 1 has the largest cost and also the largest potential for impacts, impacts resulting from Alternatives 3 and 4 would not be greater than those determined for Alternative 1.

The economic analysis of construction-related impacts involved: (1) determining the direct construction-related employment and income changes; and (2) estimating the secondary economic impacts (i.e., indirect and induced impacts) on associated businesses (such as local material and equipment suppliers). Analysis of the future construction cost estimates was performed to estimate future project-related job employment impacts, since construction is not expected to begin until early 2012. As for post-construction spending, economic effects related to project operation were not included in this analysis due to the relatively small amount of money to be generated per year when compared with about $465 million of spending for construction materials and labor.

IMPLAN Input-Output Model

IMPLAN input-output modeling is used to estimate the direct and secondary multiplier effects for any spending change upon an area's economy, such as those resulting from a major construction project. The IMPLAN model represents the structure of a local economy and economic interrelationships among firms and industry sectors. The model can predict both the direct and secondary impacts of spending changes on local employment and income for each industry sector. For the Los Vaqueros Reservoir Expansion project, IMPLAN modeling was conducted for construction spending, however was not used to measure any indirect effects related to agriculture or recreation since their direct spending impacts are so minor in magnitude.

Direct project-related employment includes not only construction laborers but also pre- and post-construction management and engineering staff (i.e., for project design, permitting, operation, and administration). Secondary impacts refer to the combined indirect and induced effects resulting from the procurement of construction-related supplies and services, materials, and equipment; future spending by construction workers; and indirect project-related employment. The magnitude of secondary impacts is estimated using IMPLAN multipliers that represent the typical flow of indirect and induced spending within the county economy.

Key construction cost components were evaluated to determine their potential effect on the local economy. This analysis also identifies the major materials, services, or other cost items that would be purchased from outside Contra Costa County and estimates their proportion of the construction cost. This adjustment ensures impacts are not overestimated by attributing job and income benefits for spending that would occur outside the county's economy. For the remaining construction items, the applicable IMPLAN data sector for each cost item was identified.[1] These direct costs were then used to model the expected indirect project-related economic effects.

[1] IMPLAN data sectors correspond to North American Industry Classification System and the Bureau of Economic Analysis commodity classifications, which are used to match spending with appropriate multipliers.

Assumptions

The following section identifies the key project-related assumptions used in the socioeconomic impact analysis.

Proportion of Construction Workers Residing in Contra Costa County

A central factor determining the magnitude of the project's future employment impacts is the proportion of jobs performed by county residents. The local job impacts are a function of the match between the project's labor needs and the availability of qualified local workers. The greater the number of county residents hired by the project, the greater the economic benefits to the county's economy. While there would also be benefits to the county economy from non-county residents employed by the project (e.g., from food and fuel sales), more of their earnings would be spent outside the county.

Because the project is predominately located in Contra Costa County, it is likely that a large proportion of construction workers would be local residents. According to 2000 U.S. Census data on local commuting patterns, 75.3 percent of all workers employed in Contra Costa County are also county residents. In addition, the size and duration of the Los Vaqueros Reservoir Expansion Project are expected to make employment very attractive to local construction workers. The project location in eastern Contra Costa County is also relatively accessible for workers living in San Joaquin County and eastern Alameda County.

The economic analysis also considered the possibility that an insufficient number of local workers would be available to meet the labor needs if the expansion were to coincide with any other major construction projects in the area. Section 4.1.3 Cumulative Impacts Analysis, and Appendix I, Projects Considered for Cumulative Analysis of Land-side Resources and Issue Areas, provide a list of projects that have the potential to occur during part or all of the 3-year Los Vaqueros Reservoir Expansion project construction period. Large public works projects, such as construction of the Altamont Water Treatment Plant in Alameda County and Vasco Road Improvements in Contra Costa County have the most potential to compete for workers who are skilled in electrical, concrete and other work on large-scale structures. Construction of other major land use projects including Mountain House (San Joaquin County), Cecchini Ranch and other Discovery Bay residential developments would likely also employ area construction workers. However these projects would not necessarily compete for the same type of workers who build larger scale facilities.

In 2007, Contra Costa County had an estimated combined unemployment rate of 4.7 percent compared to a state average of 5.4 percent (EDD, 2008). Furthermore, future regional employment growth has been estimated to continue at about 0.7 percent annually between 2002 and 2012.[2] Statewide new job growth is projected at approximately a rate of 1.5 percent annually between 2004 and 2014 (EDD, 2007). During this 10-year period, employment in the region's construction sector as a whole has been projected to increase by 9.3 percent, while heavy construction employment was projected to increase from 9,100 to 9,400 jobs (3.3 percent growth) (EDD, 2007).

2 The California Employment Development Department (EDD) provides future employment projections for the Oakland Metropolitan Statistical Area, which consists of both Alameda and Contra Costa Counties.

Although the trends indicated above suggest there may be a reduced availability of local workers, the high desirability of reservoir expansion jobs (due to the size and duration of such work) would nonetheless encourage local employment by county residents. Based on the current national downturn in construction, it is not anticipated that there will be an insufficient number of local workers. Also, the expansion project could offer employment opportunities to a wider workforce than other large construction projects in the region (such as the on-going Bay Bridge replacement project) that have a greater need for specialized construction skills. Based on this information, and to provide a conservative estimate of the potential job benefits to Contra Costa County, an assumption that 40 percent of the project's employment would come from county residents is used in this analysis.

Procurement of Construction Material and Equipment

The magnitude of the construction spending impacts and related indirect economic effects would depend on the proportion of local procurement and on local value-added for construction materials and services. For example, if there is a greater availability of cranes and other construction equipment within the county, then there could be a greater amount of indirect local construction spending.

Key material costs for the project consist of pipe materials as well as concrete and other rock materials. Because of the size, type, and quantity of pipeline materials required by the project, virtually all the pipeline-related materials would be manufactured outside of Contra Costa County. Consequently, project expenditures on these items are expected to have a negligible economic impact on the local economy.

Similarly, major proportions of the sand, gravel, and other rock materials for the reservoir expansion project are expected to be imported to the site from quarries outside Contra Costa County. Embankment fill materials for the shell and core zone of the reservoir would be obtained mostly on site. However, extensive quantities of roller-compacted concrete and other import material (e.g. filter, drain, rip-rap, and bedding rock) needed for the dam enlargement and pipeline placement would have to be imported.

While rip-rap bedding for the original Los Vaqueros Reservoir construction was obtained within Contra Costa County from the Cemex Aggregate (formerly RMC Lonestar), most of the other rock materials for the project are expected to be acquired from quarries outside the county. During construction of the original Los Vaqueros Reservoir most of the drain rock was obtained from Granite Construction's Tracy Quarry (in San Joaquin County). Besides its Tracy location, Granite's Vernalis Quarry (also in San Joaquin County) is also considered a likely candidate source for the project's filter sand, drain gravel, and roller-compacted concrete aggregate supplies. Quarry run rock for the abutment may also be obtained from the Jackson Valley Quarry located in Amador County (URS, 2008).

The site's location and access routes also favor transportation of these materials and other project supplies from the region east of Contra Costa County, accessed by interstate highways 5, 580, and 205. Consequently project expenditures on the majority of the concrete and other rock materials for the dam expansion can be expected to have a negligible economic impact on the local economy.

Therefore, for the purposes of the economic analysis it is estimated that only 10 percent of the dam material expenditures would be for materials procured from within Contra Costa County.

A major proportion of the equipment required for the project would be relatively specialized excavation, crane, and other hauling equipment likely obtained from outside Contra Costa County. The other major equipment cost would be fuel expenditures, which also have a near negligible "value added" component to Contra Costa's economy. As a result, it is expected that project-related equipment expenditures would have a very minor economic impact on the Contra Costa County economy. For the purposes of the economic analysis it is conservatively estimated that only 5 percent of the project equipment expenditures ($145M x 0.05 percent or approximately $10M) would be for materials procured from within Contra Costa County (see Table 4.17-5).

Contingency Cost

Contingency costs were included in the projected construction spending estimates, which include future employment projections. Contingency spending was applied proportionately to the base cost item projections. If future construction does not require use of the contingency funds, then both the future direct impacts (employment and income effects) and secondary economic impacts on the county would be reduced correspondingly.

Construction Spending

The majority of the construction spending was assumed to match IMPLAN's "Sector 40 – Water, Sewer, and Pipeline" category. Since the release of the 2001 IMPLAN data sets, the sectoring scheme for IMPLAN has been based on the North American Industry Classification System and has 509 sectors. This sectoring scheme very closely follows the 1997 BEA Benchmark Study for the United States sectoring. The sectoring scheme provides a systematic identification of businesses, which enables a community's economy and economic interrelationships to be represented and modeled. Accordingly, IMPLAN multipliers for that category were used to estimate the direct and indirect employment and income impacts.

The full cost estimate for an expanded Los Vaqueros Reservoir would include mitigation and land acquisition costs. However, because land acquisitions can, in many cases, represent transfer in capital between owners both within and outside the county, such transactions might not result in any new spending in the economy. In such cases, it would be inappropriate to estimate economic impacts from the land exchange. The costs for future mitigation measures are currently insufficiently specified to estimate the nature and proportion of this spending that may be expected to benefit the Contra Costa County economy. To be conservative in the estimate of economic benefits associated with the expansion project, spending for mitigation and land acquisition was not included in the economic impact analysis. In any case, the magnitude of the potential mitigation spending is far less than the contingency expenditures included in the impact analysis. Consequently, the omission of the mitigation spending is not expected to substantially alter the project's estimated economic impact to Contra Costa County.

Any remaining "other costs" are expected to consist predominantly of additional technical services for project design, construction management, and implementation. These costs were assumed to correspond to IMPLAN's "Sector 506 – Engineering, Architectural Services" category. However, because these costs have not been determined and are by their nature unknown, these spending items were not included to be conservative in the economic impact analysis. Similarly, given the unknown nature and magnitude of the project's expenditures for "general conditions and unlisted items allowances," spending on these items was also excluded in the economic impact analysis for Contra Costa County.

Significance Criteria

For this analysis, the significance of impacts related to employment and income was determined based on the expected proportional changes in the corresponding economic sector. County economies are inherently dynamic and so are subject to fluctuation due to seasonal effects, population changes, and other natural economic cycles of growth and contraction. Therefore, for purposes of this analysis, an alternative was determined to result in a significant adverse socioeconomic effect if it would result in a substantial, discernible adverse change in Contra Costa County's existing economy (i.e., over 0.5 percent) as a result of one or more of the following:

- Local construction related income or employment changes
- Loss of agricultural production and value that would have a substantial adverse economic effect in the local or regional area in which the facilities are located such that substantial quantities of agricultural land would be taken out of production in addition to those directly affected by the project
- Loss of recreation-related visitor spending that would have a substantial adverse economic effect to the local or regional area's economy in which the facilities are located

Based on the total economic output for Contra Costa County (see Table 4.17-1) 0.5 percent of $118,108M (output is provided in millions of dollars) is equal to nearly $6 billion dollars.

Impact Summary

Table 4.17-3 provides a summary of the impact analysis for issues related to socioeconomics based on the project description including construction activities outlined in Chapter 3, Project Description.

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no new facilities would be constructed, and no agricultural lands would be temporarily or permanently removed from production or experience production decreases as a result of facility siting. Agricultural and recreational facility operations in the project area would continue in manners similar to current conditions. Therefore, the ongoing economic and fiscal benefits of agricultural production and recreation-related income in the project area would be expected to continue at existing levels. There would be no adverse socioeconomic impact under the No Project/No Impact Alternative.

TABLE 4.17-3
SUMMARY OF IMPACTS – SOCIOECONOMICS

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.17.1: Project construction could temporarily generate new income and local employment that could benefit Contra Costa County's economy.	B	B	B	B
4.17.2: Loss of agricultural land use associated with project construction and development could affect Contra Costa County and Alameda County's economy.	LS	LS	LS	LS
4.17.3: Short-term loss of recreation income associated with project construction could affect Contra Costa County's economy.	LS	LS	LS	LS
4.17.4 Construction of the project alternatives, when combined with construction of other future projects, could have a potentially beneficial effect on income and local employment.	B	B	B	B
4.17.5: Construction of the project alternatives, when combined with construction of other future projects, could have a potential cumulative effect on Contra Costa County's economy as a result of temporary loss of agricultural land uses.	SU	SU	LS	LS
4.17.6 Construction of the project alternatives, when combined with construction of other future projects, could have a potential cumulative effect on Contra Costa County's economy as a result of temporary recreational impacts.	LS	LS	LS	LS

NOTES:
SU = Significant Unavoidable Impact
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact
B = Beneficial Impact

Impact 4.17.1: Project construction could temporarily generate new income and local employment that could benefit Contra Costa County's economy. (Beneficial Impact)

Alternative 1

Table 4.17-4 shows the estimated total construction costs for the Los Vaqueros Reservoir Expansion Project, assuming a 275,000-acre-foot (275 TAF) reservoir, conveyance pipelines, and other facilities fully described in Chapter 3, Project Description for Alternative 1. The project cost figures are escalated to a future anticipated "mid-point" of construction in order to avoid over or under-estimating future construction costs.

The estimated cost for Alternative 1 facility construction is about $465 million in "above the line" spending. The "above the line" costs are the most assured spending components directly related to the physical construction of the new facility. Other more variable project costs include design

TABLE 4.17-4
ESTIMATED CONSTRUCTION COST FOR EXPANDED LOS VAQUEROS RESERVOIR – ALTERNATIVE 1

Item Description	Cost (in millions of mid-term dollars)
Reservoir Expansion	$110
Transfer Facility Reservoir / Pump Station Expansion	$40
Delta Pump Station	$20
Raw Water Conveyance	$225
Power Supply	$40
Subtotal	**$465**
Design & Construction Management	$170
Other (Land Acquisition / Mitigation)	$25
General Conditions & Unlisted Items Allowance[a]	$210
Contingency	$145
Total construction cost	**$985**

[a] Includes future cost escalation to project's mid-term. All costs approximate and may not total exactly due to rounding.

SOURCE: URS, 2008.

and construction management costs of about $170 million, potential contingency spending of up to $145 million, and other possible cost increases from the estimated future cost escalation and design changes ("General Conditions and Unlisted Items Allowance") that could add as much as $210 million. Overall, the total construction cost for the proposed Alternative 1 is conservatively estimated to be $985 million (URS, 2008).

Table 4.17-5 shows the estimated total project construction cost by cost type and the proportion of that spending expected to occur from Contra Cost County workers and businesses to evaluate the economic impacts of the future construction spending specifically within Contra Costa County. A relatively minor proportion of the project's equipment and materials spending is expected to occur within Contra Costa because many of these items are highly specialized (e.g. pipeline materials) and therefore are expected to be obtained from manufacturers, distributors, or quarries located outside Contra Costa County (URS, 2008). The estimated spending column for Contra Costa County shows the estimated maximum in-county spending after major imported materials (such as pipelines), imported equipment, and out-of-county labor costs were removed. These adjusted county spending estimates were then used in the IMPLAN model to determine the local direct and indirect economic impacts of the project.[3]

As shown in Table 4.17-5, it is estimated that about $115 million of the project's total construction cost would be spent within Contra Costa County for labor, technical services, equipment, or materials. Construction labor and technical services are expected to be the primary

[3] Only major cost items were removed from the construction spending. The IMPLAN model also adjusts its secondary impact estimates based on past patterns of county economic leakage for the industry.

TABLE 4.17-5
ESTIMATED CONSTRUCTION SPENDING – ALTERNATIVE 1

Cost Type	Estimated Cost (in millions of 2008 dollars)	Estimated Contra Costa Spending[b] (in millions of 2008 dollars)	Estimated Other Regional Spending[c] (in millions of 2008 dollars)
Construction Labor / Technical Services[a]	$70	$30	$40
Equipment[a]	$145	$10	$135
Materials[a]	$220	$10	$210
Design & Construction Management	$170	$15	$155
Other (Land Acquisition / Mitigation)	$25	-	$25
General Conditions & Unlisted Items[d]	$210	$30	$180
Contingency[d]	$145	$20	$125
Total construction cost	**$985**	**$115**	**$870**

[a] Mid-points of construction values have been used for the estimated allocation by cost type.
[b] The spending estimates have been adjusted to remove major expense items that would not have a direct economic effect on the county's economy, either because materials and equipment must be imported (e.g., pipelines) or because the spending would make little direct economic contribution (e.g., land sales), or it insufficiently specified to allocate (e.g. mitigation).
[c] For the purposes of the analysis the greater Bay Area Region consists of the Bay Area Counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma, and San Joaquin.
[d] The contingency and general conditions spending in Contra Costa is based on the estimated construction spending in Contra Costa.

SOURCE: MWH 2007; URS 2008.

component of the project-related spending within Contra Costa since most of the materials and equipment would most likely be obtained from businesses elsewhere in the greater Bay Area region. Approximately 40 percent of the project's direct labor and technical services are expected to be provided by Contra Costa County businesses and residents which is equivalent to approximately $30 million in direct spending. For the project's equipment expenditures, approximately 95 percent ($135 million of the project's total $145 million) of the estimated equipment cost is expected to consist of fuel, services, and specialized construction equipment that would be imported from outside the Contra Costa County. A similar proportion of the project's estimated materials cost ($220 million of the project's total $230 million) is expected to consist of sand, gravel, pipelines and other specific materials that must be imported from outside the county. Although such "other regional spending" will not benefit Contra Costa's economy, the expenditures will directly benefit both the region's economies and the state as a whole.

The proportion of estimated project spending for project design, general conditions and contingency cost items (i.e. expenses not related to "direct" construction labor, material or equipment) within Contra Costa County are based on the estimated distribution for the above direct construction spending within the Contra Costa. Since most labor and technical services are non-taxable, the estimated project-related sales tax benefits to Contra Costa County would be up to $0.85 million. Actual sales tax benefits could be further reduced depending on the proportion of the design, contingency and other non-labor "below the line costs" are in fact incurred by the project. These estimates of the Contra Costa County and other regional spending are approximate but reflect both the character of the local and regional economies and the project location which favors importation of materials, equipment, and workers from San Joaquin and Alameda Counties.

In addition to the income and related employment benefits that Contra Costa County would gain from construction expenditures paid to its local businesses and residents, Contra Costa County would also receive significant project-related sales and/or use tax[4] benefits on expenses related to construction materials. Under California tax regulations, Contra Costa County could receive sales and use tax revenues equal to 1 percent of total taxable sales spending for the entire project.[5] Material and equipment purchases would be taxable while most labor and services spending would not be taxable. Consequently, based on the estimated sales distribution in Table 4.17-5, assuming that up to $825 million of the total construction costs could be for taxable materials and equipment items, Contra Costa County could receive up to $8.25 million in future sales and use tax revenues from the project (this would include the local sales tax benefits from the expected $85 million in construction spending within Contra Costa described in the previous paragraph).[6] The magnitude of the tax benefit to Contra Costa will vary depending on the both the extent actual construction spending and the proportion of the purchased materials and services whose providers have already collected the applicable sales taxes.

Future project-related employment has been determined based on the expected crew staffing levels over the length of the project's approximately 3-year-long projected construction period. During construction, about 400 employees would be working at full mobilization. Correspondingly, it is conservatively estimated that the total project employment would be about 1,200 full-time equivalents (FTEs). Employment figures are expressed as full-time equivalent employment, a computed statistic representing the number of full-time employees or workers that would be employed if the number of hours worked by part-time employees is calculated as if worked by full-time employees.

Applying a conservative full-burdened average labor expense of $145,000 per employee (MWH, 2007), it is estimated that employment of 1,200 FTEs would correspond to $174 million in project labor costs. This would be consistent with the approximate estimate of $70 million for the direct construction spending and $170 million in design and construction management spending shown in Table 4.17-5.

Of the project's total employment, it is estimated that about 40 percent of these workers might reasonably be expected to represent Contra Costa residents during their period of project employment. Jobs created are calculated as full-time equivalents for the entire construction period. The actual number of construction workers onsite during peak construction periods would vary, as some workers could be employed for shorter periods of time than others and some workers may work part-time. It is expected that a considerable proportion of the "white collar" and more senior

4 Purchasers (such as the Contra Costa Water District or the construction contractor) are required to pay "use" taxes to the California Board of Equalization on their taxable goods or services purchases if applicable sales taxes have not been collected by the seller. California State Board of Equalization regulations allow for the direct distribution of the local taxes to the local jurisdiction of the construction site for certain qualifying contracts. Construction contractors who enter into a construction contract equal to or greater than $5 million may elect to direct allocation of tax to the jurisdiction in which the jobsite is located.

5 Under the 2004 "triple flip" tax legislation (Code Section 97.68) the State of California retained ¼ percent of the sales tax returns to cities and counties to repay economic recovery bonds. However, the local governments receive ad valorem property tax revenues in lieu of the withheld revenues to make up the difference.

6 Construction cost estimates include applicable sales taxes.

jobs could likely be filled by non-Contra Costa County residents, since these jobs are not as location dependant and have skill requirements that may need to be obtained from a more regional area.

Table 4.17-6 shows both the direct construction jobs and secondary jobs that could be generated by the project. The majority of the secondary jobs would be service or trade industry jobs, including new jobs in support industries (providing services and materials required by project construction) as well as other service and trade jobs resulting from the increased spending within the county by construction workers making purchases with their earnings.

TABLE 4.17-6
EMPLOYMENT IMPACTS IN CONTRA COSTA COUNTY BY SECTOR

	Projected Employment (Full-Time Equivalent)				
	Direct	Secondary[a]	Annual Total[b]	Current (2004)	% Change
Agriculture				2,796	-
Construction	480	4	161	46,518	< 0.1%
Manufacturing		8	3	24,398	< 0.1%
Transportation, Communications, and Public Utilities		29	10	32,695	< 0.1%
Trade		96	32	63,121	< 0.1%
Financial, Investment, and Real Estate		42	14	67,310	< 0.1%
Services		316	105	217,361	< 0.1%
Government		2	1	45,719	< 0.1%
Total	**480**	**497**	**326**	**499,917**	**< 0.1%**

[a] Includes both indirect and induced impacts.
[b] Based on a 3-year estimated construction period.
Totals may not add exactly due to rounding.

SOURCES: MIG 2007; ESA.

Based on the assumption that 40 percent of construction workers reside in Contra Costa County, it is estimated that about 480 jobs (FTEs) would be filled by Contra Costa residents while the remaining 720 FTE jobs would predominantly staffed by Alameda or San Joaquin residents. As a result of project-related local income and employment growth, nearly an additional 500 indirect or secondary jobs would generated by the expected $115 million of spending on wages and materials within the county. These jobs would be created in businesses providing project-related goods and services, or alternatively in other businesses catering to project employees (e.g. retail, food etc.). Of these jobs, the majority would likely be lower skilled positions. Because these jobs would primarily be associated with services needed to support project construction, these jobs would constitute indirect employment and, as such, would represent secondary project-related economic benefits.

The projected employment impacts were also estimated on an annual basis over the main construction period to determine the expected annual project-related employment. The annualized employment effects were then compared to existing conditions to evaluate the magnitude of the projected economic impacts.

In addition to employment benefits, the project would also have direct and secondary benefits on Contra Costa County's level of economic output. **Table 4.17-7** presents the project's expected impacts on the county's output for the major industrial sectors.

TABLE 4.17-7
OUTPUT IMPACTS IN CONTRA COSTA COUNTY BY SECTOR

	Projected Output (in millions of 2008 dollars)				
	Direct	**Secondary[a]**	**Annual Total[b]**	**Current (2004)**	**% Change**
Agriculture				$1,340	–
Construction	$115		$38	$7,481	0.5%
Manufacturing		$8	$3	$44,782	< 0.1%
Transportation, Communications, and Public Utilities		$5	$2	$12,319	< 0.1%
Trade		$10	$3	$7,091	0.1%
Financial, Investment, and Real Estate		$12	$4	$16,574	< 0.1%
Services		$28	$9	$19,684	0.1%
Government		$8	$3	$8,837	< 0.1%
Total	**$115**	**$71**	**$62**	**$118,108**	**< 0.1%**

[a] Includes both indirect and induced impacts.
[b] Based on a 3-year construction period and to the nearest million dollars.
Totals may not add exactly due to rounding.

SOURCES: MIG 2007; ESA.

Table 4.17-7 shows both the direct construction-related and secondary economic output generated by the project. Output represents the value added to the economy by the economic activity. The majority of the secondary output associated with the project would be in the service, trade, and financial-related industry sectors. Overall, about a $71 million beneficial output impact is projected for the secondary impacts to the Contra Costa County economy, which would result in beneficial effects. Because the amount of spending is less than 0.5 percent of the Countywide economy, however, the project effect represents a less than significant beneficial economic impact upon the Contra Costa County economy.

Alternative 2

Because Alternative 2 facilities and construction would be the same as for Alternative 1, the benefits from construction spending and employment associated with Alternative 2 would be the same as Alternative 1. Because the amount of spending is less than 0.5 percent of the Countywide economy, however, the project effect represents a less than significant beneficial economic impact upon the Contra Costa County economy.

Alternative 3

The benefits from construction spending and employment associated with Alternative 3 would be similar to but less than Alternative 1, because this alternative would not include construction of either the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. Modifications to the Old River Intake and Pump Station would be constructed under Alternative 3 however costs and associated socioeconomic benefits would be less than the cost of a completely new intake. Full cost estimates are not available for Alternative 3, but like Alternative 1, this alternative would result in beneficial economic effects. Because the amount of spending is less than 0.5 percent of the Countywide economy, however, the project effect represents a less than significant beneficial economic impact upon the Contra Costa County economy.

Alternative 4

The benefits from construction spending and employment associated with Alternative 4 would be similar in nature to but much less in magnitude than Alternative 1 because this alternative would involve a smaller reservoir expansion (160 TAF rather than 275 TAF) and fewer facility improvements. Full cost estimates are not available for Alternative 4, but like Alternative 1, this alternative would result in beneficial economic effects. Because the amount of spending is less than 0.5 percent of the Countywide economy, however, the project effect represents a less than significant beneficial economic impact upon the Contra Costa County economy.

Mitigation: None required.

Impact 4.17.2: Loss of agricultural land use associated with project construction and development could affect Contra Costa County and Alameda County's economy. (Less than Significant)

Introduction

Temporary or long-term reduction in agricultural resources has the potential to affect Contra Costa County's economy. As indicated in Table 4.17-1, the County has an estimated 2,796 agricultural jobs and $1,340,000,000 in agricultural output, measured in 2008 dollars. The Contra Costa County Department of Agriculture 2007 Crop Report indicates that of the County's 482,000 total acres, the Land in Farms is 126,228 acres (2002 Census) and Harvested Cropland is 26,018 Acres (2002 Census) (Contra Costa County, 2007).

As discussed in Section 4.8, Agriculture, there are six classifications of agricultural land found in the project vicinity; however, only the Prime Farmland, Farmland of Statewide Importance, and Unique Farmland classifications are considered for purposes of determining impact significance. Although impacts to Farmland of Local Importance, Grazing Land and Other Land are not considered significant, they are assessed in Section 4.8 for disclosure purposes (see Figure 4.8-1).

Reservoir Expansion and Recreation Facilities. The CCWD Watershed property includes land designated under the FMMP as Farmland of Local Importance, Grazing Land or Other Land.

Intake Facilities. The new Delta Intake and Pump Station would be sited on land designated Farmland of Statewide Importance. The existing Old River Intake and Pump Station is also located on land designated Farmland of Statewide Importance, however no property beyond the existing facility boundaries is proposed for use.

Conveyance Facilities. The eastern portion of the Delta-Transfer Pipeline extends through areas of Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. The western portion of the Delta-Transfer Pipeline and the Transfer-LV Pipeline would occur primarily on Grazing Land and Farmland of Local Importance. The Transfer Facility Expansion would occur on land designated as Farmland of Local Importance. The Transfer-Bethany Pipeline would primarily pass through lands designated Farmland of Local Importance and, to a lesser degree, through areas designated as Grazing Land.

Power Supply Facilities. Under Power Option 1 (Western Only), the proposed Western substation and its access road would occur on lands designated as Grazing Land. Proposed transmission lines would connect with one or both intakes near Old River, passing through lands designated as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. To the west, near the existing Transfer Station, existing and proposed transmission lines pass through lands designated as Prime Farmland, Farmland of Local Importance, and Other Lands.

Under Power Option 2 (Western & PG&E), the proposed PG&E substation and its access road would occur on lands designated as Grazing Land. Proposed transmission lines would connect with one or both intakes along Old River, passing through lands designated as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland. To the west, near the existing Transfer Station, existing and proposed transmission lines pass through lands designated as Prime Farmland, Farmland of Local Importance, and Other Land.

Alternative 1

As analyzed in Section 4.8, Agriculture, and shown in Table 4.8-5, temporary construction activities associated with Alternative 1 (under Power Option 1) would affect as much as 91 acres of Prime Farmland, 39 acres of Unique Farmland, and 41 acres of Farmland of Statewide Importance for total impacts to Important Farmland of 170 acres. The project construction, including pipeline and transmission line construction, would occur over a period of up to 3 years, so only a portion of the acreage that would be temporarily affected would be out of agricultural production in any one year. The affected acreage represents a small proportion of Contra Costa County's total active agricultural land base: in 2006 there were over 262,000 total acres, of which 41,619 acres were determined to be Important Farmland, as shown in Table 4.8-1 (DLRP, 2008).

Although much of the CCWD Watershed property is used for grazing, the purpose of the grazing is for habitat management. As mitigation for construction of the existing Los Vaqueros Reservoir, the

CCWD Watershed Lands are managed to provide premium kit fox habitat as defined by the Biological Opinion for the original reservoir project. Land management activities include grazing cattle and sheep on large portions of the District property (approximately 10,000 acres) in order to provide 800 to 1200 pounds of forage per acre as specified by the Biological Opinion.

Construction of the project components for Alternatives 1 would require the permanent conversion of 21.7 acres of Farmland of Statewide Importance. The additional agricultural acreages that would be converted are listed by project component in Table 4.8-6.

Overall, the loss of 21.7 acres of Important Farmland attributed to the proposed project would be small in comparison to the more than 41,619 acres of farmland in Contra Costa County, an estimated 0.001 percent. The relatively small proportion of affected agriculture lands indicates that Alternative 1 would not result in any substantial displacement of agricultural workers, associated loss in employment income and tax revenues, or other loss of revenues. The economic and associated socioeconomic effects upon Important Farmland are less than significant.

Alternative 2

Because the facilities construction would be the same, Alternative 2 would have the same impacts as Alternative 1. The economic and socioeconomic effects of Alternative 2 upon Important Farmlands are less than significant.

Alternative 3

Impacts to agriculture under Alternative 3 would be less than Alternatives 1 and 2 because this alternative does not include construction of a new Delta Intake or Transfer-Bethany Pipeline. Although this Alternative would include expansion of the Old River Intake and Pump Station, construction would not extend beyond the existing facility site and there would be no farmland permanently converted under Alternative 3. Alternative 3 (under Power Option 1) would temporarily affect as much as 91 acres of Prime Farmland, 39 acres of Unique Farmland, and 19 acres of Farmland of Statewide Importance for total impacts to Important Farmland of 149 acres. As with Alternative 1, the project's construction would occur over a period of up to 3 years, so only a portion of the acreage that would be temporarily affected would be out of agricultural production in any one year. Based on the relatively small proportion of affected agriculture lands, Alternative 3 is not expected to result in any substantial displacement of agricultural workers, associated loss in employment income and tax revenues, or other loss of revenues. The economic and socioeconomic effects of Alternative 3 upon Important Farmlands are less than significant.

Alternative 4

Alternative 4 would result in less impact than under Alternative 1 because it would involve a smaller reservoir expansion and construction of fewer facilities including no pipeline construction. There would be no Important Farmland temporarily affected or permanently converted under Alternative 4. Based on no impacts to Important Farmland, Alternative 4 is not expected to result in displacement of agricultural workers, associated loss in employment income and tax revenues, or other loss of revenues. The economic and socioeconomic effects of Alternative 4 upon Important Farmland are less than significant.

Mitigation: None required.

Impact 4.17.3: Short-term loss of recreation income associated with project construction could affect Contra Costa County's economy. (Less than Significant)

Alternative 1

Under Alternative 1, recreational use of Los Vaqueros Reservoir and its watershed would be precluded for a 6 to 12 month period to drain the reservoir and then about 4 years to allow for construction of the dam expansion and refilling the expanded reservoir. The most recent visitor data, attendance by month over a 6-year period (July 2001 through June 2008), indicates that annual attendance ranges by year from 28,966 (during the 12-month period ending June 30th 2002) to 18,129 (ending June 30th 2006) with most visitors to the watershed during the spring (March to May) and autumn (September and October). During a recent 12-month period (ending June 30th, 2008), total visitation at Los Vaqueros was 23,717.

Based on the daily fishing access pass permits sold during 2007-08 financial year, the total number of user days by anglers fishing at the reservoir were estimated to be 20,237 (85% of visitors). With approximately 85 percent of current visitor use for fishing or boating, annual hiking and other non-reservoir uses (e.g. picnicking) lake would be an estimated 15 percent or about 3,480 visitors (Mueller, 2008).

According to the analysis in Section 4.15, Recreation, most fishing use at the reservoir is expected to be temporarily displaced from the county to other locations such as Lake Del Valle, San Francisco Bay, the Bay-Delta, the San Joaquin River, and other water bodies. Hiking would be displaced to the numerous East Bay Regional Park District parks (many located within Contra Costa County), Mt. Diablo State Park, and other local parks. Given that the proportion of non-resident users is high, and that comparable alternative water recreation locations within the county are limited, it is conservatively assumed that up to 90 percent of the spending by the displaced recreational visitors could occur outside of Contra Costa County's economy during project construction.

There are few recreational analyses estimating the average daily spending locally by recreational users. However, spending by hikers is generally recognized to be very limited. The most comparable analysis of the recreational user spending in the region was performed as part of a comprehensive economic impact study performed by Economic Planning Systems for the neighboring East Bay Regional Park District in 2000. The economic analysis estimated that typical local spending by park users was about $6 per visit (in 2008 dollars) (EPS, 2000). This would suggest that the approximately 3,480 non-fishing visitors (primarily hikers) at Los Vaqueros would generate about $20,880 in local spending.

The past permit sales and boat rental revenues indicate recreational boating activity and spending at the reservoir since all anglers must purchase permits and only electric watercraft rented from the Los Vaqueros Reservoir's marina operations are permitted to be used on the reservoir. In 2008, an estimated total of 20,237 anglers spent nearly $75,900 on fishing access fees at Los Vaqueros (Mueller, 2008). In addition, the 1,808 boat rentals at the reservoir generated $77,400 in sales during the 2007-08 financial year. Total sales revenues at the reservoir (including nearly $138,000 in additional revenues from parking and retail sales) were about $291,000. Combined with the estimated local spending by non-fishing visitors to Los Vaqueros, the total local spending directly associated with Los Vaqueros recreationists can be estimated to be up to $311,900[7].

Using the conservative assumption that up to 90 percent of the reservoir's current recreational use could be displaced out of the county economy temporarily during project construction, then about $280,700 of annual recreational spending would be lost by the Contra Costa economy. However, as a proportion of the county's total annual income of about $26,775 million by its Trade and Services sectors (and given the concurrent benefits of the construction-related income), the loss of $280,700 in recreation-related spending (approximately a 0.001 percent decrease) would represent a less-than-significant impact on the county's economy. Therefore, the impact on the economy from the temporary lost recreation use under Alternative 1 would be less than significant.

Alternative 2

Because the facilities construction would be the same under Alternative 2 as Alternative 1, Alternative 2 impacts are the same impacts as Alternative 1. Therefore, the impact on the economy from the temporary lost recreation use under Alternative 2 would be less than significant.

Alternative 3

Recreation-related socioeconomic impacts under Alternative 3 would be the same as under Alternative 1 because Alternative 3 would involve the same level of reservoir expansion to 275 TAF and would include the same level of replacement and enhancement of recreation facilities within the Los Vaqueros Watershed as Alternative 1, and for the same duration. Therefore, the impact on the economy from the temporary lost recreation use under Alternative 3 would be less than significant.

Alternative 4

Recreation-related socioeconomic impacts under Alternative 4 would be less than under Alternative 1 because Alternative 4 would involve reservoir expansion to only 160 TAF, resulting in shorter construction duration of about 2 years. Alternative 4 would not include a marina complex or interpretive center, however it would include replacement of existing recreation facilities within the Los Vaqueros Watershed, with an overall smaller effect on recreation and the

7 The EPS estimates presumably represent conservative visitor spending projections. Consequently, for estimating total local spending by Los Vaqueros visitors, the EPS spending estimate has been added to the actual total Los Vaqueros sales (even though some hiker's sales will have likely been made at the Reservoir).

county's economy than Alternative 1. Therefore, the impact on the economy from the temporary lost recreation use under Alternative 4 would be less than significant.

Mitigation: None required.

Impact 4.17.4: Construction of the project alternatives, when combined with construction of other future projects, could have a potentially beneficial effect on income and local employment. (Beneficial Impact)

All Alternatives

Impact 4.17.1 identifies a temporary increase in income and local employment resulting from the location of the project facilities and construction of the project alternatives. This represents an incremental cumulative contribution to local and regional incomes and employment. Public works and land development projects identified in Section 4.1.3 Cumulative Impacts Analysis, and Appendix I, Projects Considered for Cumulative Analysis of Land-side Resources and Issue Areas, indicate that there could be other construction underway during part or all of the 3-year Los Vaqueros Reservoir Expansion project construction period. Large public works projects, such as construction of the Altamont Water Treatment Plant in Alameda County and Vasco Road Improvements in Contra Costa County plus land development projects such as Mountain House (San Joaquin County), Cecchini Ranch and other Discovery Bay residential developments could result in construction expenditure effects to local or regional residents and businesses, which would then similarly affect local and regional employment and income conditions. The location of the project facilities and construction of the project alternatives, in combination with construction of other future development, would be considered a cumulative beneficial impact. While this effect is relatively minor within the context of County income and employment, it is considered to be beneficial.

Mitigation: None required.

Impact 4.17.5: Construction of the project alternatives, when combined with construction of other future projects, could have a potential cumulative effect on Contra Costa County's economy as a result of temporary loss of agricultural land uses. (Less than Significant for Alternatives 3 or 4; Significant and Unavoidable for Alternatives 1 or 2)

Alternative 1

Impact 4.17.2 indicates that the socioeconomic impacts associated with temporary loss of agricultural land use resulting from construction activities would be less than significant. Due to the small area affected by these impacts and the temporary nature of the construction activities, these impacts were determined to be negligible in relation to the overall regional economy. However, in Section 4.8, the agricultural analysis determined that the project would have significant cumulative impact on the region's agricultural resources because the project would result in the permanent reduction of Important Farmland (Impact 4.8.4).

With or without the project, the trend of land conversion from agricultural uses to urban and other non-agricultural uses (e.g., wildlife habitat enhancement) in the Central Valley would continue. It is likely that other future projects, such as expansion of Discovery Bay into the Cecchini Ranch property that would require large tracts of land, would convert agricultural lands to non-agricultural uses; these lands may or may not be designated Prime Farmland, Unique Farmland, and Farmland of Statewide Importance and may or may not be under Williamson Act contracts.

As a number of the proposed projects listed in Appendix I, "Local Development Projects Considered in Cumulative Impact Analyses," are not yet in the environmental planning stage, the acreage of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance that could be converted by these projects is not known. However, in general, the acreage of Prime Farmland, Unique Farmland, and Farmland of Statewide Importance in Contra Costa County and, to a lesser degree, in Alameda County, is expected to decline. The proposed project would contribute incrementally to this decline. Therefore, the incremental contribution of farmland conversion associated with the proposed project would be a cumulatively considerable contribution to an existing significant cumulative impact. This impact would therefore be significant and unavoidable.

Alternative 2

Under Alternative 2, which would construct the same facilities as Alternative 1, the project would result in a significant and unavoidable cumulative impact with respect to the cumulative conversion of Farmland of Statewide Importance to non-agricultural use, even with implementation of mitigation Measure 4.8.2a and 4.8.2b. The incremental contribution of farmland conversion associated with the proposed project would be a cumulatively considerable contribution to an existing significant cumulative impact. Under Alternative 2, this impact would therefore be significant and unavoidable.

Alternative 3

Under Alternative 3, no Important Farmland would be permanently impacted because this Alternative does not involve construction of the new Delta Intake and Pump Station or the Transfer-Bethany Pipeline. Impacts under Alternative 3 would not be cumulatively considerable, and therefore the level of significance would be less than significant.

Alternative 4

Under Alternative 4, no Important Farmland would be permanently impacted because this Alternative does not involve construction of the new Delta Intake and Pump Station or new water conveyance pipelines through agricultural areas. Furthermore, Alternative 4 would not involve construction of Power Supply facilities. Impacts under Alternative 4 would not be cumulatively considerable, and therefore the level of significance related to cumulative impacts would be less than significant.

Mitigation Measure

Implementation of Agricultural Resources Mitigation Measures 4.8.1 and 4.8.2 (a and b) would minimize potential impacts under Alternatives 1 and 2; however, those measures would not reduce cumulative impacts to less than significant levels. The level of significance after mitigation would be a significant and avoidable cumulative impact.

Impact Significance after Mitigation: Significant and Unavoidable for Alternatives 1 or 2; Less than Significant for Alternatives 3 and 4.

Impact 4.17.6: Construction of the project alternatives, when combined with construction of other future projects, could have a potential cumulative effect on Contra Costa County's economy as a result of temporary recreational impacts. (Less than Significant)

All Alternatives

As described in Section 4.15, "Recreation," the project-related temporary loss of recreational opportunities and subsequent relocation of Los Vaqueros recreational facilities would result in a less than significant cumulative impact on recreational facilities and use. The project's recreational impacts are also projected to be temporary with no long term change to the area's recreational facilities and uses. Given the less than significant cumulative impact on recreation resources, there would correspondingly be a less than significant related cumulative impact on the region's economy from the project. The recreational-related economic sector is only a minor component of the area's economy, so a very large change in that sector would need to occur to be sufficient in magnitude to result in a significant economic impact on the economy as a whole. The recreational analysis concludes that no other development projects that would affect recreation at Los Vaqueros or other state and regional parks in the area. Therefore, no corresponding economic changes would be expected associated with the recreational use at these other parks.

As a result, the cumulative economic impacts from project-related construction and relocation of the recreation facilities are determined to be less than significant.

Mitigation: None required.

4.18 Environmental Justice

This section provides an analysis of the potential environmental justice impacts that would result from implementation of the Los Vaqueros Reservoir Expansion Project. The analysis includes a description of the existing conditions, the associated regulatory framework (including all applicable environmental justice policies), the methodology, and assessment of the expected project-related impacts.

4.18.1 Affected Environment

Regulatory Setting

This section provides the federal, regional, and local regulations concerning environmental justice that would apply to the Los Vaqueros Reservoir Expansion Project.

Federal

Executive Order 12898

On February 11, 1994, President Clinton issued "Executive Order 12898 on Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The order was designed to focus attention on environmental and human health conditions in areas of high minority populations and low-income communities, and to promote nondiscrimination in programs and projects substantially affecting human health and the environment (Federal Register, 1994). The order requires the U.S. Environmental Protection Agency (U.S. EPA) and all other federal agencies (as well as state agencies receiving federal funds) to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations.

Environmental Justice Implementation Plan

In 1997, the U.S. EPA's Office of Environmental Justice released the *Environmental Justice Implementation Plan*, supplementing the U.S. EPA's environmental justice strategy and providing a framework for developing specific plans and guidance for implementing Executive Order 12898. In 1998, federal agencies received a framework for the assessment of environmental justice in the U.S. EPA's *Guidance for Incorporating Environmental Justice Concerns in the EPA's National Environmental Policy Act Compliance Analysis*. This framework emphasizes the importance of selecting an analytical process appropriate to the unique circumstances of the potentially affected community.

State

While several California state agencies have used the U.S. EPA's *Environmental Justice Implementation Plan* as a basis for the development of their own environmental justice strategies and policies, the majority of these agencies do not yet have guidance for incorporating environmental justice impact assessment into the California Environmental Quality Act (CEQA) process. However, the State of California has a number of legislative and agency actions associated with environmental justice, as described below.

California Government Code

Section 65040.12 of the California Government Code states that:

> "[E]nvironmental justice" means the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.

Under Assembly Bill 1553, signed into law in October 2001, the Governor's Office of Planning and Research (OPR) is required to adopt guidelines for addressing environmental justice issues in local agencies' general plans. California Code Section 65040.12 also established the OPR as the "coordinating agency in state government for environmental justice programs;" it also directs the agency to coordinate its efforts and to share information regarding environmental justice programs with federal agencies, and to review and evaluate any information obtained as a result of their respective regulatory activities. To this end, the OPR prepared the *Environmental Justice in California State Government*; this policy report gives a brief history of environmental justice, reports on the status of the OPR's efforts, and provides for future environmental justice efforts within state government. OPR also provides general environmental justice guidelines in its most recent *2003 General Plan Guidelines*. OPR is currently in the process of updating these Guidelines (Litchney, 2008).

Although the OPR policy report, the California State Lands Commission (CSLC) Environmental Justice Policy (discussed below), and state legislation provide useful background information and guidance on the equitable treatment of environmental justice populations, no specific guidelines have been adopted at the state level to guide environmental justice in CEQA environmental documents. As such, most state agencies have been using federal guidance to assess the environmental justice impacts of the projects under their review.

California State Lands Commission Environmental Justice Policy

The CSLC developed an Environmental Justice Policy to ensure equity and fairness in its own processes and procedures, and in October 2002 adopted an amended policy. The policy ensures that "environmental justice is an essential consideration in its processes, decisions and programs and that all people who live in California have a meaningful way to participate in these activities" (CSLC, 2008). The CSLC implements the policy, in part, by identifying and communicating with relevant populations that could be adversely and disproportionately affected by CSLC projects or programs, and by ensuring that a range of reasonable alternatives is identified to minimize or eliminate environmental impacts affecting such populations. This discussion is provided in this EIS/EIR consistent with and in furtherance of the CSLC's Environmental Justice Policy. Under the agency's adopted environmental justice policy, CSLC's staff is required to report back to the Commission on how environmental justice is integrated into its programs, processes, and activities (CSLC, 2002).

Local

Contra Costa County Policy

In response to Executive Order 12898, metropolitan transportation agencies and councils of governments in some parts of California have developed environmental justice policies. The Contra Costa County Board of Supervisors established an Environmental Justice Policy in 2003, affirming its concurrence with California Government Code Section 65040.12. The Board of Supervisors also indicated that “Contra Costa County will conduct its programs, policies and activities that substantially affect human health or the environment, and promote enforcement of all health and environmental statutes under County jurisdiction in a manner that ensures fair treatment of people of all races, cultures, and income levels, including minority populations and low-income populations of the County.” The Board of Supervisors directed the future development of agency guidelines—a process that is ongoing.

Alameda County Policy

Alameda County does not have an adopted Environmental Justice Policy related to implementing Executive Order 12898 (Bonekempber, 2008).

Metropolitan Transportation Commission

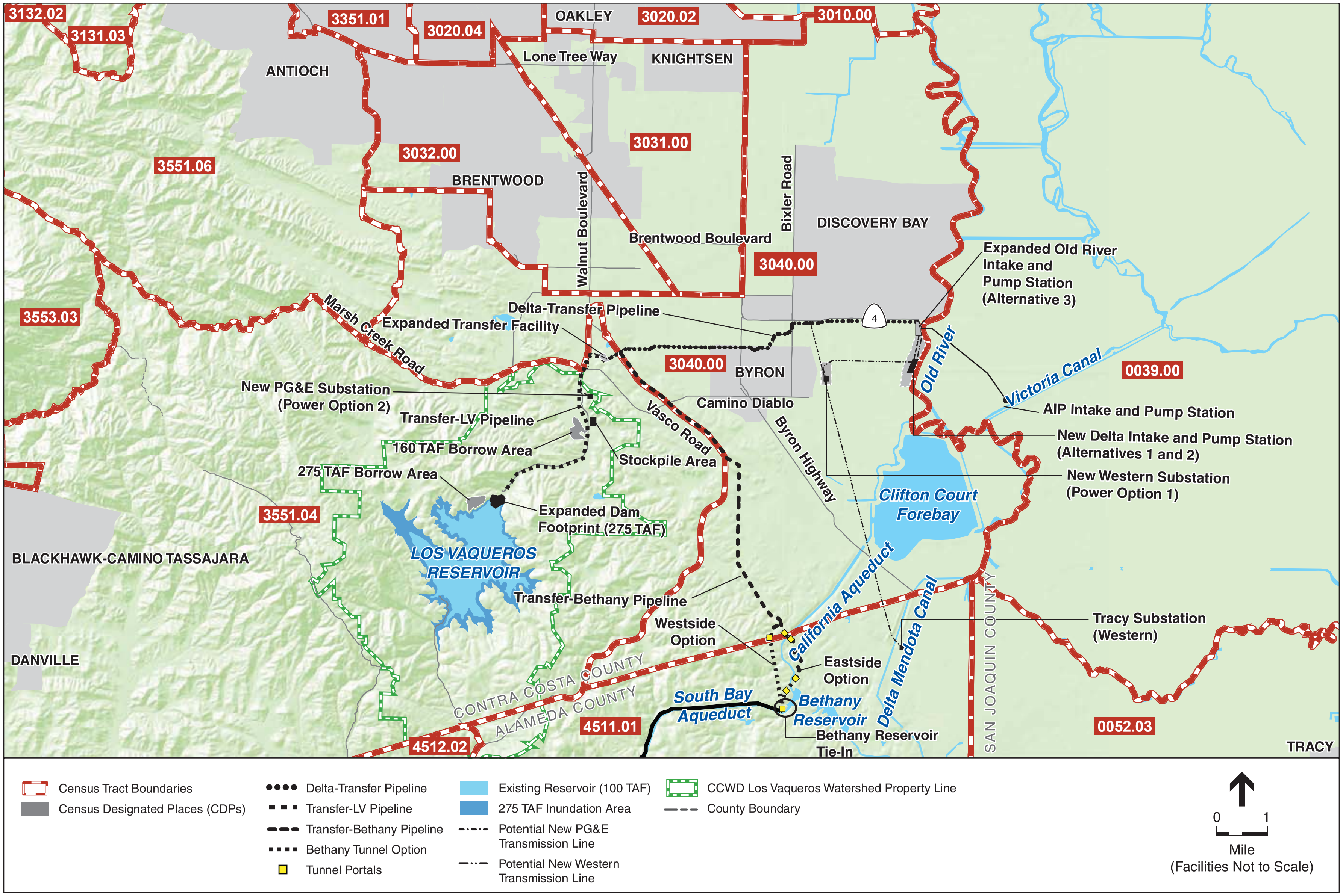
The Metropolitan Transportation Commission’s (MTC’s) *2001 Regional Transportation Plan Equity Analysis and Environmental Justice Report* provides one of the most substantial recent environmental justice analyses and is used by several other Bay Area agencies as a model for their approach and analysis of environmental justice issues.

Environmental Setting

For the purpose of this analysis, the potentially affected environmental justice population was determined to be the communities located within a two-mile radius of the project alternatives. This impact area encompasses the communities that could be subject to construction or operation-related impacts associated with the project. The five corresponding census blocks for these communities are shown in **Figure 4.18-1**, as is the geographic area of the Byron Census-Designated Place (CDP). A CDP is a location that is identified by the United States Census Bureau for statistical purposes. CDPs are delineated to provide data for settled concentrations of population that are identifiable by name but, like the town of Byron, are not legally incorporated.

Census Tract 0039.01 is not included in the analysis, as there is only a very small residential population in close proximity to the Old River Intake and Pump Station or the New Delta Intake and Pump Station.[1]

[1] The vast majority of the 1,549 residents in Census Tract 0039.01 live in western Stockton, which is more than 8 miles from the eastern-most area where construction-related effects might be expected to occur.



SOURCE: USGS, 1993 (base map); and ESA, 2008

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 4.18-1
Census Tracts and CDPs within the Project Vicinity

Minority Populations

According to the federal Council on Environmental Quality (CEQ) guidelines for environmental justice analyses:

> Minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the majority population percentage in the general population or other appropriate unit of geographic analysis. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds (CEQ, 1997).

Information regarding racial diversity in the project area was derived from the 2000 U.S. Census. The racial composition for Contra Costa County and the census tracts within two miles of the project area are presented in **Table 4.18-1**. The non-white population of Census Tract 3031.00 (located approximately a mile north of Byron) was 55.5 percent of the tract's entire population; as a result, in accordance with the CEQ guidelines, this census tract qualifies as minority community of concern.

TABLE 4.18-1
RACIAL COMPOSITION (PERCENT) FOR CONTRA COSTA COUNTY AND THE SURROUNDING AFFECTED ENVIRONMENT

	White	Hispanic / Latino[2]	Black	American Indian / Alaska Native	Asian	Native Hawaiian / Pacific Islander	Other
Contra Costa County	57.9%	17.7%	9.2%	0.4%	10.8%	0.3%	3.7%
City of Brentwood	63.1%	28.2%	2.4%	0.4%	2.7%	0.2%	3.1%
Byron CDP	64.3%	25.9%	4.4%	1.1%	2.2%	0.2%	2.0%
Tract 3031.00	44.5%	49.3%	1.6%	0.3%	1.5%	0.1%	2.5%
Tract 3032.00	67.5%	19.0%	1.9%	0.4%	4.4%	0.3%	3.7%
Tract 3040.00	79.6%	13.3%	1.9%	0.7%	1.7%	0.1%	2.7%
Tract 3551.04	72.8%	4.5%	2.5%	0.2%	17.4%	0.1%	2.5%
Tract 4511.01	75.8%	10.5%	2.0%	0.2%	7.3%	0.1%	4.1%

Minority community of concern.

SOURCE: U.S. Census Bureau, 2000a.

Low-Income Populations

The CEQ's environmental justice guidance does not clearly define low-income populations as those meeting the census poverty thresholds, but states that "Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty."

2 The federal statistical system and the U.S. Census Bureau classify race and Hispanic/Latino origin as two separate concepts. In other words, each person has two attributes, their race (or races) and whether or not they are Hispanic/Latino, to account for the fact that people of Hispanic/Latino origin may be of any race. For more information on the definition of the term "Hispanic and Latino," see U.S. Census Bureau, 2004, at http://www.census.gov/population/www/socdemo/compraceho.html. This EIS/EIR specifically identifies "Hispanic/Latino" residents as a potential minority population of concern for the environmental justice analysis.

Poverty thresholds vary according to a household's size and composition. The most current poverty thresholds (2007) are $21,027 for a two-parent household with two children (U.S. Census, 2007). These thresholds provide one national measurement of income that is not adjusted for regional costs of living. Among its poverty statistical data, the U.S. Census Bureau also reports population data income ratios from 50 percent to 200 percent of the poverty threshold (U.S. Census Bureau, 2000b) at a census tract population level.[3] For many federal and state programs, eligibility levels are significantly higher than the poverty level (e.g., the eligibility criterion is 185 percent of the poverty level to qualify for food stamp assistance in California under the Women, Infants, and Children program).[4] The MTC's *2001 Regional Transportation Plan Equity Analysis and Environmental Justice Report* definition of low-income community states:

> Low-income is defined as the household income that is at or below the U.S. Department of Health and Human Services Poverty Guidelines. For the purposes of this exercise (i.e., the 2001 Regional Transportation Plan Equity Analysis) the definition of low-income to households was established as households at or below 200 percent of poverty. This level was used to reflect the relatively high cost of living in the Bay Area. Zones, where the low-income population was 30 percent of the total population or greater, were included in the Equity Analysis (MTC, 2001).

Table 4.18-2 presents poverty level data for the project area communities.[5]

TABLE 4.18-2
INCOME OF CONTRA COSTA COUNTY AND THE SURROUNDING AFFECTED ENVIRONMENT

	Total Population (2000)	Population with Incomes Below Poverty Level	Population with Incomes Below 200 Percent of Poverty Level	Population with Incomes More than 200 Percent of Poverty Level
Contra Costa County	938,310	7.6%	18.7%	81.3%
City of Brentwood	23,211	5.8%	15.6%	84.4%
Byron CDP	826	14.9%	40.6%	59.4 %
Tract 3031.00	8,304	10.4%	30.5%	69.5%
Tract 3032.00	21,533	4.2%	9.9%	90.1%
Tract 3040.00	10,824	5.4%	11.6%	88.4%
Tract 3510.04	15,997	1.4%	3.6%	96.4%
Tract 4511.01	4,579	2.8%	5.9%	94.1%

Low-income community of concern.

SOURCE: U.S. Census Bureau, 2000b.

3 The most current census level demographic information available is from the 2000 Census. The proportion of individuals below the poverty level are based on 2000 population, income and poverty level threshold data.

4 The Women, Infants, and Children program is a California Department of Health Services nutrition program that helps pregnant women, new mothers, and young children eat well and stay healthy.

5 Census Track 0039.01 is not included in the analysis, as there is a negligible residential population in close proximity to the Old River Pump Station or the New Delta Intake and Pump Station since the vast majority of the 1,549 residents in Census Tract 0039.01 live in western Stockton, which is more than 8 miles from the eastern-most area where construction-related effects might be expected to occur.

As shown in the table, Byron has nearly twice the Contra Costa County average of residents living below the poverty level. In addition, under the MTC's more inclusive low-income community definition, Census Tract 3031.00 (located about a mile north of Byron)—with almost a third of its population living below 200 percent of the poverty level compared to the countywide average of 18.7 percent—would also be recognized as a low-income community. Therefore in assessment of the project alternatives, both Census Tract 3031.00 and the community of Byron (Byron CDP) are considered low-income communities.

As indicated in the Environmental Setting discussion, above, the communities of concern for the project environmental justice analysis is the larger minority and low-income populations within Census Tract 3031.00 as well as the low-income Byron CDP area.

4.18.2 Environmental Consequences

Methodology

This section analyzes the distributional patterns of high-minority and low-income populations on a regional basis and characterizes the distribution of such populations adjacent to the project area. This analysis focuses mainly on whether the project has the potential to disproportionately affect area(s) of high-minority population(s) and low-income communities and thus create an adverse environmental justice impact. According to Executive Order 12898, an environmental justice impact would be considered significant and would require mitigation if the construction or operation of the project would cause any minority or low-income population to bear a disproportionate share of an adverse impact.

According to CEQ and EPA guidelines established to assist Federal and State agencies, the first step in conducting an environmental justice analysis is to define minority and low-income populations. Based on these guidelines, a minority population is present in a project area if: (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. By the same rule, a low-income population exists if the project area consists of 50% or more people living below the poverty threshold, as defined by the U.S. Census Bureau, or is significantly greater than the poverty percentage of the general population or other appropriate unit of geographic analysis. The second step of an environmental justice analysis requires a finding of a high and adverse impact. The CEQ guidance indicates that when determining whether the effects are high and adverse, agencies are to consider whether the risks or rates of impact "are significant (as employed by NEPA) or above generally accepted norms." The final step requires a finding that the impact on the minority or low-income population be disproportionately high and adverse. While none of the published guidelines define the term "disproportionately high and adverse," the CEQ includes a non-quantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population.

Significance Criteria

The following thresholds use factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its effects. To make a finding that disproportionately high and adverse effects would likely fall on the minority or low-income population, three conditions must be met simultaneously: (1) there must be a minority or low-income population in the impact zone; (2) a high and adverse impact must exist; and (3) the impact must be disproportionately high and adverse on the minority or low-income population.

The project alternatives would result in a significant environmental justice impact if it would result in both the following:

- A significant environmental effect that would result in a high and adverse impact on an identified minority or low-income population that is disproportionately high and adverse, exceeding the impact on the general population or other appropriate comparison group. Potential adverse environmental impacts associated with this type of major infrastructure project and therefore analyzed in this EIS/EIR include (1) construction or operation related nuisance effects (e.g. – traffic, noise, dust and/or hazards); and (2) construction or operation effects on local employment opportunities; and

- The identified minority or low-income population would be disproportionately affected by cumulative or multiple adverse exposures impacts.

Impact Summary

Table 4.18-3 provides a summary of the impact analysis for issues related to environmental justice based on actions outlined in Chapter 3.

Impact Analysis

No Project/No Action Alternative

Under the No Project/No Action Alternative, no physical changes to the environment would occur. The project alternative facilities would not be constructed, and existing Contra Costa Water District (CCWD) facilities would continue to be operated as under current conditions. Because no physical activities would occur, there would be no potential for harm or disproportionate disturbance to minority and low-income communities.

Impact 4.18.1: Construction and operation of the project alternatives would result in air quality, noise, and/or other environmental impacts related to traffic and other construction activities that would not disproportionately affect nearby minority and/or low-income communities. (Less than Significant)

Alternative 1

The project area extends throughout southeastern Contra Costa County and northeastern Alameda County. As indicated above, the City of Brentwood (in Contra Costa County) is located about

TABLE 4.18-3
SUMMARY OF IMPACTS – ENVIRONMENTAL JUSTICE

Impact	Project Alternatives			
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
4.18.1: Construction and operation of the project alternatives would result in air quality, noise, and/or other environmental impacts related to traffic and other construction activities that would not disproportionately affect nearby minority and/or low-income communities.	LS	LS	LS	LS
4.18.2: Construction and operation of the project alternatives would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project.	NI	NI	NI	NI
4.18.3: Construction and operation of the project alternatives when combined with construction of other past, present, and probable future projects, would result in air quality, noise, and/or other environmental impacts related to traffic and other construction activities that would not disproportionately affect nearby minority and/or low-income communities.	LS	LS	LS	LS
4.18.4: Construction and operation of the project alternatives, when combined with construction of other past, present, and probable future projects, would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project.	NI	NI	NI	NI

NOTES:
SU = Significant Unavoidable Impact
LSM = Less-than-Significant Impact with Mitigation
LS = Less-than-Significant Impact
NI = No Impact

four miles north of the project area, and the City of Livermore in Alameda County is located seven miles south of the project area. Two unincorporated towns are located in the project area - Byron and Discovery Bay (see Figure 4.18-1).

Two communities of concern have been identified for analysis within the Los Vaqueros Reservoir Expansion project area. The population living within Census Tract 3031.00, located south of the Knightsen area and east of the City of Brentwood, is recognized as a minority and low-income population; the population living within the Byron CDP is recognized as a low-income population. Together the residents of these areas compose the project area communities of concern.

Proximity of Project Facilities to Communities of Concern

The proximity of project facilities to the identified minority and low-income areas, and the relative effect upon those communities, is discussed below.

Reservoir Expansion and Recreational Facilities. Alternative 1 involves a 275 TAF Reservoir Expansion/Dam Modification project with borrow areas, PG&E substation (under Power Option 2) and recreation facilities constructed within the CCWD Watershed property. Project facilities located in the CCWD Watershed property are over two miles from Census Tract 3031.00 and the Byron CDP.

New Delta Intake and Pump Station. The new Delta Intake and Pump Station site is located in an agricultural area about 3.4 miles from Census Tract 3031.00 and about 1.6 miles from the Byron CDP.

Conveyance Facilities. Alternative 1 includes construction of three water conveyance pipelines and expansion of the existing Transfer Facility. Under Alternative 1, approximately 18.7 miles of water pipelines would be constructed; only 6 percent of the total miles of pipeline would border on the Byron CDP. Of the 16 rural residences and the numerous residences in Discovery Bay that are located along the Delta-Transfer Pipeline, only 3 are located within the Byron low-income area.

- The Delta-Transfer Pipeline would be located within the existing road rights-of-way that pass approximately one mile south of Census Tract 3031.00 and adjoin the Byron CDP for about 1.1 miles of the pipeline's 6.5 mile alignment. Approximately 3 rural homesteads are located within the Byron CDP near this portion of the pipeline, while an additional 13 residences adjacent to this pipeline alignment would be located in non low-income communities.

- The Transfer Facility Expansion would occur on CCWD land next to the existing Transfer Facility, approximately 1.7 miles southwest of Census Tract 3031.00 and approximately 2.0 miles east of the Byron CDP.

- The Transfer-LV Pipeline alignment would pass in close proximity to numerous individual residences, however the facility would be approximately 1.7 miles southwest of Census Tract 3031.00 and approximately 2.0 miles east of the Byron CDP.

- The Transfer-Bethany Pipeline would pass south along Vasco Road, near but not through the Byron CDP approximately 3,000 feet to the east.

Power Supply. To accommodate a New Delta Intake and Pump Station as well as the expansion of the Transfer Facility, additional overhead electrical power lines and a substation would be required. Two options for electrical facilities are under consideration: Power Option 1 (Western Only) and Power Option 2 (Western and PG&E).

- Construction of Power Option 1 includes a new power line from Western's Tracy Substation to the New Delta Intake facilities, with a new Western substation at the eastern terminus of Camino Diablo Road. The new powerline, which would largely be located within an existing transmission corridor, would be located approximately 2.0 miles southeast of Census Tract 3031.00 and could be as close as 100 feet east of the Byron CDP. A new Western substation along this alignment could be located approximately 1.5 miles south of Census Tract 3031.00 and as close as 100 feet east of the Byron CDP. Review of aerials photographs shown in Chapter 3 indicates that there is agricultural land and no residences located along this eastern border of the Byron CDP or in the substation siting zone for Power Supply Option 1.

- Power Option 2 would entail a new PG&E substation within the CCWD Watershed property in an area to the north of the staging area, plus a new distribution line connecting the new PG&E substation to the expanded Transfer Facility. Most of the power facilities would occur within an existing right-of-way or on Watershed land, a minimum 1.7 miles southwest of Census Tract 3031.00 and approximately 2.0 miles east of the Byron CDP. Power Option 2 would also involve powerlines on the eastern side of the project area, a minimum of 1.9 miles southeast of Census Tract 3031.00 and approximately 500 feet east of the Byron CDP.

As shown on Figure 4.18-1 and discussed above, about 1.1 mile of the Delta-Transfer Pipeline (portion along Kellogg Creek Road) would be located on the border of the Byron CDP. It is also possible that a Power Supply Option 1 (Western Only) substation and power lines would be constructed directly east of the Byron CDP. It should be noted that the eastern end of the Byron CDP contains few residences and the substation siting zone is located in an agricultural area with no residences. No project construction and operation activities would occur in Census Tract 3031.00. In effect, a low proportion of the Alternative 1 facilities would be in close proximity (within 1 mile) of low-income populations of concern, and the majority of the project pipelines, power supply and other facilities would be located in non-minority and non-low-income areas.

Construction Impacts

The type of construction activities that would occur under Alternative 1, and the relative effect on the identified minority and low-income population, is discussed below.

Construction Traffic. Earthmoving activities such as excavation, grading, soil stockpiling, and filling would occur during construction. Pipelines would be installed through trenching and jack-and-bore tunneling. These activities would result in some short-term increases in vehicle trips by construction workers and construction vehicles and may require use of some alternative travel routes by local residents. Based on information found in Section 4.9 Transportation and Circulation, the roadways that would be most affected by construction activities during the project's 3-year duration include SR4, Vasco Road, Byron Highway, Walnut Boulevard and Camino Diablo. These roads, and in particular Byron Highway, pass through or near the communities of concern. However, due to both the nature of the construction activities and the road network, the construction activities (and its related traffic impacts) will vary in both their location and occurrence. Consequently, the construction traffic is expected to have some temporary, localized impacts to the area residents. However, the duration and magnitude of these and the other indirect traffic impacts are projected to be less than significant with implementation of Mitigation Measure 4.9.1. Since no significant traffic impact is expected to affect the broader project area (see Section 4.9, Transportation and Circulation), and only a small proportion of the construction would occur within areas with low-income populations, no disproportionate adverse impacts on minority or low-income communities would occur.

Construction Air Quality and Noise. Project-related construction activities could cause short-term increases in fugitive dust, equipment exhaust emissions, and sound levels. Although construction would cause temporary air quality and noise impacts, these short-term impacts would be localized to a smaller construction area. Such impacts are typical of construction projects, are temporary, and would be less than significant with mitigation (see Section 4.10, Air Quality; and Section 4.11, Noise). Further, only a small proportion of the construction would occur within the Byron CDP (and none within Census Tract 3031.00), therefore no disproportionate adverse air quality or noise impacts to minority or low-income communities would occur.

Electric and Magnetic Fields Health Impacts. As described in Section 3.5.5, Power Supply Infrastructure, the project would involve construction of new power supply facilities to support operation of the expanded Los Vaqueros system. New electrical transmission lines would be extended to the new Delta Intake and Pump Station and the Expanded Transfer Facility and one or two new electrical substations would be required in the project area. Since there would be new transmission lines and other power facilities constructed as part of the Los Vaqueros Reservoir Expansion Project, EMF levels would increase, and there would be some potential for increased exposure by people and the environment to EMF. However, as indicated in Section 4.13.1, Affected Environment, there are no federal or state regulations governing EMF except near schools. None of the project components would be located within one-quarter mile of an existing or proposed school so this criterion would be met and impacts related to EMF would be less than significant. Since the potential for electric and magnetic fields impacts are less than significant, no disproportionate electric and magnetic fields impacts to minority or low-income communities would occur.

Summary

All of the project construction planned for Alternative 1 would be located in non-minority communities since all project construction would occur a minimum of 1 mile from Census Tract 3031.00. Approximately 6 percent of the total pipeline construction for the project (1.1 mile of the Delta Transfer Pipeline) construction would directly border the Byron CDP. It is also possible that under Power Option 1 (Western Only) powerlines and a substation would be located as close as 100 feet from the eastern border of the Bryon CDP. However, based on a review of a current aerial photograph for Power Supply Option 1, there are no residences along the eastern border of the Byron CDP or in the substation siting zone. Furthermore, none of the project components would be located within one-quarter mile of an existing or proposed school and therefore the potential for electric and magnetic field impacts are less than significant. Because relatively little construction would occur near the Byron CDP and none in Census Tract 3031.00, construction impacts to areas with minority or low-income populations would not cause a disproportionate impact to the minority and low-income community in the area. Construction of the project would involve activities and use equipment typical for any construction project; temporary traffic, air quality and noise effects would be mitigated to less than significant levels. Alternative 1 would not cause a disproportionate impact to the minority and low-income community in the area, and environmental justice impacts would be less than significant.

Alternative 2

The facilities included in Alternative 2 would be the same as those under Alternative 1. Therefore, like Alternative 1, construction and operation of the Project under Alternative 2 would not disproportionately affect the identified populations of concern, and environmental justice impacts would be less than significant.

Alternative 3

Construction of Alternative 3 would largely include the same components as discussed above for Alternative 1 with three relevant differences. First, expansion of the Old River Intake and Pump

Station would occur within the facility's existing site area. The Old River facility is located approximately 3.3 miles southeast of Census Tract 3031.00 and approximately 1.9 miles east of the Byron CDP and therefore is not considered close enough to affect those communities of concern.

Also, Alternative 3 would exclude construction of a New Delta Intake and Pump Station and Transfer-Bethany Pipeline, reducing the amount of construction in eastern Contra Costa County and northeastern Alameda County. Without this new construction, there would be no potential to effect communities of concern.

In summary, as with Alternative 1, Alternative 3 would not cause a disproportionate impact to the minority and low-income community in the area, and environmental justice impacts would be less than significant.

Alternative 4

Alternative 4 would involve a 160 TAF Reservoir Expansion/Dam Modification project with a borrow area and recreational facilities to be constructed within CCWD Watershed property lines. Under this alternative, the existing Transfer Station capacity would be expanded, but there would be no change in the facility structure or footprint. Alternative 4 would not include construction of any Delta Intake, Conveyance or Power Supply facilities, and would avoid areas with identified populations of concern.

Alternative 4 would not implement any project activities within 2 miles of Census Tract 3031.00 or the Byron CDP, whereas under Alternative 1 construction of some facilities would occur within 2 miles of these communities. Construction and operation of Alternative 4 would not cause a disproportionate impact to the minority and low-income communities in the area, and environmental justice impacts would be less than significant.

Mitigation: None required.

Impact 4.18.2: Construction and operation of the project alternatives would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project. (No Impact)

Alternative 1

The project would generate approximately 1,200 full-time-equivalent (FTE) positions during the estimated three-year construction period (400 FTEs per year). The expansion of the reservoir and associated facilities would offer a range of labor opportunities for area workers of low to high skill levels. Construction of the Los Vaqueros Reservoir Expansion and associated facilities could offer employment opportunities to a wider workforce than other large construction projects in the region (such as the Bay Bridge replacement project) that have a greater need for specialized construction skills. Based on this information, and to provide a conservative estimate of the potential job benefits to Contra Costa County, an assumption that 40 percent of the project's employment would come from county residents is used in this analysis. These project-related jobs would include a high proportion of low-skilled labor positions and apprenticeships that would be open to vicinity residents, including minority and low-income residents in the communities of concern. Of the estimated 1,200 projected employment opportunities, up to a third of the positions (400 positions) could be relatively low-skilled employment. These jobs would be accessible to minorities living in the area based upon their proximity to the open positions, and their relatively low cost of commuting to project job sites. Furthermore, since construction would not occur in the sensitive communities, construction would not interfere with businesses in minority communities. Instead, construction workers would be likely to bring some new business to local restaurants, retail outlets, and lodging.

While completion of Alternative 1 would end the short term construction employment opportunities, there would be no long-term local job reductions associated with the new expanded Los Vaqueros Facility. Future operation of the expanded Los Vaqueros reservoir and associated facilities would require a very minor increase in the staffing levels for its future operations and maintenance. As a result there would be no future adverse impacts on the local job opportunities available to the local low-income and minority community members.

Upon completion, the expanded reservoir would also increase low-cost recreation options and access to fishing at the reservoir. These are beneficial impacts that would improve the quality of life for all CCWD customers and citizens of the county, and particularly populations that reside in close proximity and chose to take advantage of low cost recreation and fishing opportunities.

Summary

The construction of Alternative 1 would temporarily increase the employment opportunities available locally to minority or low-income populations. The future operation of the expanded Los Vaqueros reservoir and associated facilities would require a very minor increase in the staffing levels for its future operations and maintenance. The increased local recreation opportunities at the future expanded Los Vaqueros Reservoir would also be beneficial to local residents.

These effects would generally be beneficial to local residents and none would cause a disproportionate impact to the minority and low-income community in the area. Therefore construction and operation of Alternative 1 would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project; there would be “No Impact”.

Alternative 2

The facilities included in Alternative 2 would be the same as those under Alternative 1. Therefore construction and operation of Alternative 2 would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project; there would be “No Impact”.

Alternative 3

Construction of Alternative 3 would largely include the same components as discussed above for Alternative 1 with three modifications: expansion of the Old River Intake and Pump Station would occur within the facility's existing site area. However, Alternative 3 would exclude the New Delta Intake and Pump Station and Transfer-Bethany Pipeline, reducing the amount of construction in eastern Contra Costa County and northeastern Alameda County. Opportunities for local employment would still be available for local residents although they would be correspondingly reduced given the somewhat smaller amount of project construction under Alternative 3.

In summary, as with Alternative 1, construction and operation of Alternative 3 would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project; there would be "No Impact".

Alternative 4

Alternative 4 would involve a 160 TAF Reservoir Expansion and Dam Modification with a borrow area and recreational facilities to be constructed within the watershed. Under this alternative, the existing Transfer facility would be upgraded, however this facility would not expand its footprint as would occur for other alternatives. Alternative 4 would exclude construction of any Delta Intake, Conveyance or Power Supply facilities, and would avoid areas with identified populations of concern.

Unlike Alternative 1, Alternative 4 would not implement any project activities within 2 miles of Census Tract 3031.00 or the Byron CDP. As a result, construction and operation of Alternative 4 would not cause a disproportionate impact to the minority and low-income community in the area; there would be "No Impact".

Mitigation: None required.

Impact 4.18.3: Construction and operation of the project alternatives when combined with construction of other past, present, and probable future projects, would result in air quality, noise, and/or other environmental impacts related to traffic and other construction activities that would not disproportionately affect nearby minority and/or low-income communities. (Less than Significant)

All Alternatives

Impact 4.18.1 evaluates the potential for environmental justice impacts associated with temporary traffic, air quality, noise and other environmental impacts resulting from project construction activities. As discussed above, because relatively little construction would occur near the Byron CDP and none in Census Tract 3031.00, construction impacts to areas with minority or low-income populations would not cause a disproportionate impact to the minority and low-income community in the area. As also discussed above, construction of the project would involve activities and use equipment typical for any construction project; temporary traffic, air quality and noise effects would be mitigated to less than significant levels with mitigation. None of the alternatives would cause a disproportionate impact to the minority and low-income communities in the area, and project-related environmental justice impacts would be less than significant.

Cumulative Construction Projects. There is the potential for cumulative impacts associated with select other projects to be built in the same 3-year timeframe as the Los Vaqueros Expansion project (approximately 2012 to 2015) and within the same geographic area. As discussed in Section 4.1 – Approach to Analysis (see subsection 4.1.3 Approach to Cumulative Analysis), a review of local and regional development, infrastructure and transportation projects was conducted to provide a list of relevant projects (see Table 4.1.2). Construction-related impacts, including traffic, dust and noise result in localized effects; therefore, only other projects or activities in relatively close proximity (within one mile of Census Tract 3031.00 and the Byron CDP) would have the potential to add to anticipated project-generated construction impacts and create cumulative construction-related effects.

Of the projects listed, development or public works projects proposed for construction during the same timeframe as the Los Vaqueros Reservoir Expansion Project include the Cecchini Ranch development and the Brentwood Solid Waste Transfer Facility Expansion (located in Brentwood). However, these construction projects would not be located within 1 mile of Census Tract 3031.00 or the Byron CDP, and are therefore not considered relevant to a discussion of cumulative environmental justice impacts.

There are also various Road Safety Improvement and Widening Projects (SR 4, Vasco Road, Walnut Boulevard Widening and the Byron Highway) which, although scheduled for completion prior to the Los Vaqueros Reservoir Expansion, do have the potential to overlap in time and geographic area with the project alternatives. As such, they could impact minority and low-income communities where construction occurs within 1 mile of these populations. However, the improvements would not disproportionally affect Census Tract 3031.00 or the Byron CDP, since they are located throughout the region and would impact other communities at the same time. Based on this review of probable future projects, Los Vaqueros Reservoir Expansion Project construction activities would not contribute considerably to any significant cumulative effects.

Cumulative Operations. With respect to cumulative, short-term operational impacts resulting from project-related traffic and air quality sources combined with other projects and their effects, there does appear to be the potential to make a cumulatively considerable contribution to traffic and air quality effects. As discussed in their respective section (Transportation Impact 4.9.6; Air Quality Impact 4.10.2), operation of the Los Vaqueros Reservoir Expansion project under all alternatives would result in less than significant effects. But, when operation of the Los Vaqueros Reservoir Expansion project is considered in combination with operation of relevant cumulative projects, traffic and air quality, there is the potential for significant cumulative impacts for traffic and air quality to occur. However, these operational impacts to traffic and air quality would not disproportionally affect Census Tract 3031.00 or the Byron CDP, since impacts would be spread throughout the region and would impact other (non-minority and higher income) communities at the same time.

Noise levels, by comparison, are more localized than traffic and air quality, and are not anticipated to increase above ambient levels enough to result in cumulative noise impacts (see Section 4.11.2). As such, cumulative noise impacts are not anticipated.

Based on this review of probable future projects, Los Vaqueros Reservoir Expansion Project operation would not result in significant cumulative operational impacts to identified populations.

In summary for all alternatives, the cumulative impact to the County's minority and low-income populations from area construction is not cumulatively considerable and disproportionate to minority or low-income populations. Cumulative, operational impacts related to traffic and air quality may result in cumulatively considerable impacts, however these impacts would not disproportionally affect minority and low-income communities. Therefore, cumulative environmental justice impacts are considered to be less than significant.

Mitigation: None required.

Impact 4.18.4: Construction and operation of the project alternatives, when combined with construction of other past, present, and probable future projects, would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project. (No Impact)

All Alternatives

The geographic area for employment opportunities is broader than the local (i.e.- two-mile) range for potential construction impacts. Therefore, the following discussion of cumulative impacts will focus upon countywide employment opportunities and their potential cumulative effects upon minority and low-income populations.

Cumulative Construction Projects. In Section 4.17 Socioeconomic Effects, discussion under Impact 4.17.2 identified temporary beneficial countywide impacts related to new income and local employment during project construction. Discussion under Impact 4.17.4 identified beneficial cumulative impacts related to new income and local employment during project construction (also Countywide). These beneficial countywide effects could also be available to identified minority and low-income populations during the construction period.

In this Environmental Justice section, discussion under Impact 4.18.2 finds that construction of the project would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project. Instead, there would be work opportunities associated with the project that could increase income and local employment associated with construction of one of the project alternatives. Therefore, there would be no project related adverse contribution to the any significant cumulative impacts on local employment opportunities that would disproportionately affect minority and/or low-income communities in the project's vicinity.

Cumulative Operations. With respect to cumulative, long-term operational impacts resulting from project-related employment opportunities combined with other projects and their effects, there does not appear to be the potential to make a cumulatively considerable contribution. This is because there are anticipated to be only about 3 new employment positions filled after project construction is completed. Whether all the new positions were filled by minority and/or low-income residents or not, there would be no impact related to operational employment. Therefore, there would be no opportunity for a contribution to local employment and no opportunity to impact cumulative operational effects.

In summary for all alternatives, the cumulative impact to the County's minority and low-income populations from county-wide construction and operational employment opportunities is not cumulatively considerable and disproportionate to minority or low-income populations. Cumulative, construction and operational impacts related to employment opportunities may result in cumulatively considerable impacts, however these impacts would not disproportionally affect minority and low-income communities. Therefore, cumulative environmental justice impacts are considered to be less than significant.

Mitigation: None required.

4.19 Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States (U.S.) for federally-recognized Indian tribes or individual Indians. An Indian trust has three components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can include land, minerals, federally-reserved hunting and fishing rights, federally-reserved water rights, and in-stream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the U.S. The characterization and application of the U.S. trust relationship have been defined by case law that interprets Congressional acts, executive orders, and historic treaty provisions.

Consistent with President William J. Clinton's 1994 memorandum, "Government-to-Government Relations with Native American Tribal Governments," U.S. Department of the Interior (DOI), Bureau of Reclamation, Mid-Pacific Region (Reclamation), assesses the effect of its programs on tribal trust resources and federally-recognized tribal governments. Reclamation is tasked to actively engage federally-recognized tribal governments and consult with such tribes on government-to-government level (Federal Register, 1994) when its actions affect ITAs. The U.S. DOI Departmental Manual Part 512.2 ascribes the responsibility for ensuring protection of ITAs to the heads of bureaus and offices (DOI, 1995). DOI is required to "protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion" (DOI, 2000). Reclamation is responsible for assessing whether the proposed project has the potential to affect ITAs.

It is the general policy of the DOI to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible (Reclamation, 2000). The project alternatives would expand the existing Delta intake facilities at Old River to accommodate higher flows and expand Los Vaqueros Reservoir capacity to 275 TAF under Alternatives 1, 2, 3 and 160 TAF under Alternative 4. Reclamation will comply with procedures contained in Departmental Manual Part 512.2, guidelines, which protect ITAs.

The nearest ITA to the project location is the Lytton Rancheria, located approximately 33 miles west/northwest of the project area. The nearest construction activity to the Lytton Rancheria would be over 30 miles distance. The proposed action does not affect ITAs.

The potential for the project to affect significant Native American sites is addressed in Section 4.16, Cultural and Paleontological Resources.

4.20 Growth-Inducing Effects

4.20.1 Introduction

Both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) require consideration of a project's growth inducement potential as a possible way in which a project might result in indirect environmental effects.

NEPA Definition of Growth Inducement

The Council on Environmental Quality NEPA Regulations require federal agencies to address the potential indirect impacts of a proposed action in preparing environmental assessments. Indirect effects are reasonably foreseeable effects that may occur beyond the immediate timeframe of a proposed action or outside the immediate vicinity of the action area. These effects "may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate" (CFR Section 40 1508.8 [b]).

CEQA Definition of Growth Inducement

The CEQA *Guidelines* state that an environmental impact report (EIR) should discuss the ways in which a proposed project may induce growth (Section 15126.2[d]). Growth inducement is defined by the CEQA *Guidelines* as:

> *[T]he ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth ... It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.*

A project can have a direct effect on population growth if it involves construction of substantial new housing. A project can have indirect growth-inducement potential if it would (1) establish substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises) or otherwise stimulate economic activity; or (2) remove an obstacle to additional growth and development, such as removing a constraint to or increasing the capacity of a required public service. For example, an increase in the capacity of utility or road infrastructure could allow either new or additional development in the surrounding area.

Approach

The following section reviews the potential for the project, under each of the four project alternatives, to induce growth. The focus of the discussion is the extent to which an alternative could provide additional water supply to one or more Bay Area water agencies that might support additional growth.

4.20.2 Growth-Inducement Potential

Overview

None of the project alternatives involves the construction of new housing; therefore none would be directly growth inducing. Furthermore, the project, under any of the four project alternatives, would not indirectly induce growth related to establishment of substantial new permanent employment opportunities such as those created by development of commercial, industrial, or governmental enterprises; expansion of the Los Vaqueros Reservoir system would create only a few additional, permanent jobs (less than 10).

However, under some project alternatives, the project might remove an obstacle to growth by improving the reliability of water supply to one or more of the three South Bay water agencies: Alameda County Water District (ACWD), Alameda County Flood Control and Water Conservation District – Zone 7 (Zone 7), and Santa Clara Valley Water District (SCVWD); and to the Contra Costa Water District (CCWD). This section evaluates the extent to which the project alternatives could remove water supply reliability as an obstacle to growth and therefore have indirect growth-inducement potential.

Improving Supply Reliability

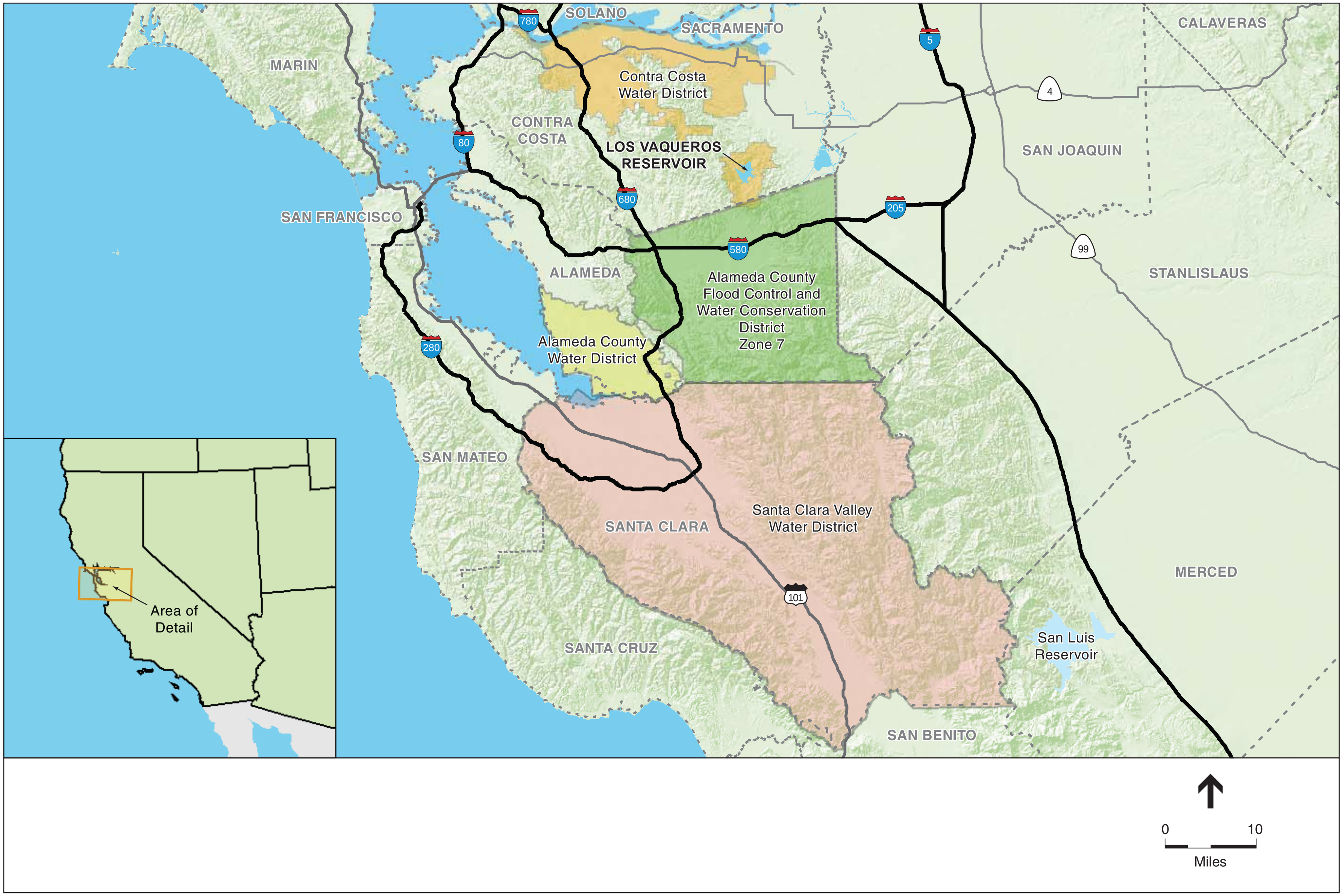
As described in Chapter 1, Purpose and Need/Project Objectives, two primary objectives pertain to all of the project alternatives: to use an expanded Los Vaqueros Reservoir to develop water supplies for environmental water management (Environmental Water Management) and to increase water supply reliability for Bay Area water providers (Water Supply Reliability). Water supplies for Environmental Water Management would not induce growth. However, increasing water supply reliability for Bay Area water providers does have the potential to remove an obstacle to growth.

Under each alternative, project operations are designed to provide some level of improvement in water supply reliability to the three South Bay water agencies or CCWD (see **Figure 4.20-1**).

By design, Alternative 1 would provide for the greatest improvement of water supply reliability. The water supply reliability improvements provided by the proposed project are categorized as follows:

- *Delta Supply Restoration* – The new and enlarged Los Vaqueros Reservoir system would be used to partially restore delivery reductions to the South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the State Water Project (SWP) and Central Valley Project (CVP) Delta export pumps.

- *Dry-Year Storage* – Additional storage in the expanded Los Vaqueros Reservoir would be used to meet dry-year needs for CCWD and the South Bay water agencies. Subsequently, the need to purchase supplemental dry-year supplies, activate dry-year exchange programs, or institute drought management measures would also be reduced. This would allow storage of water in wet periods for use in dry periods.



SOURCE: USGS, 1993 (base map); and ESA, 2008

Figure 4.20-1
CCWD and Water Districts Served by SWP's South Bay Aqueduct

- *Emergency Storage* – Additional storage in the expanded Los Vaqueros Reservoir would be available for delivery to Bay Area water agencies through the South Bay Connection or existing interties in the event of a levee failure, chemical spill, or other emergency.

Alternative 1

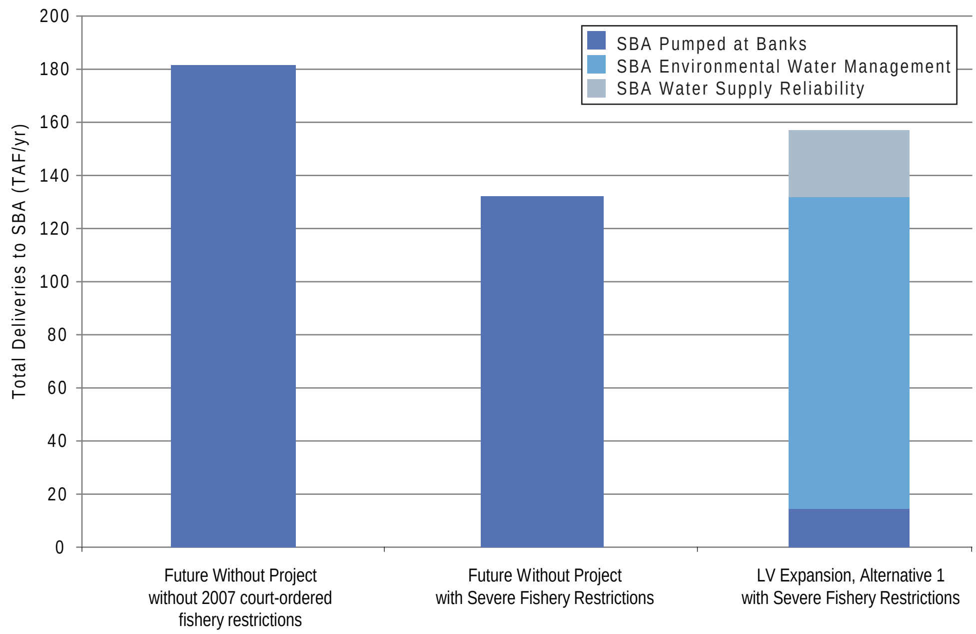
Water Supply Reliability Improvements Provided by the Project

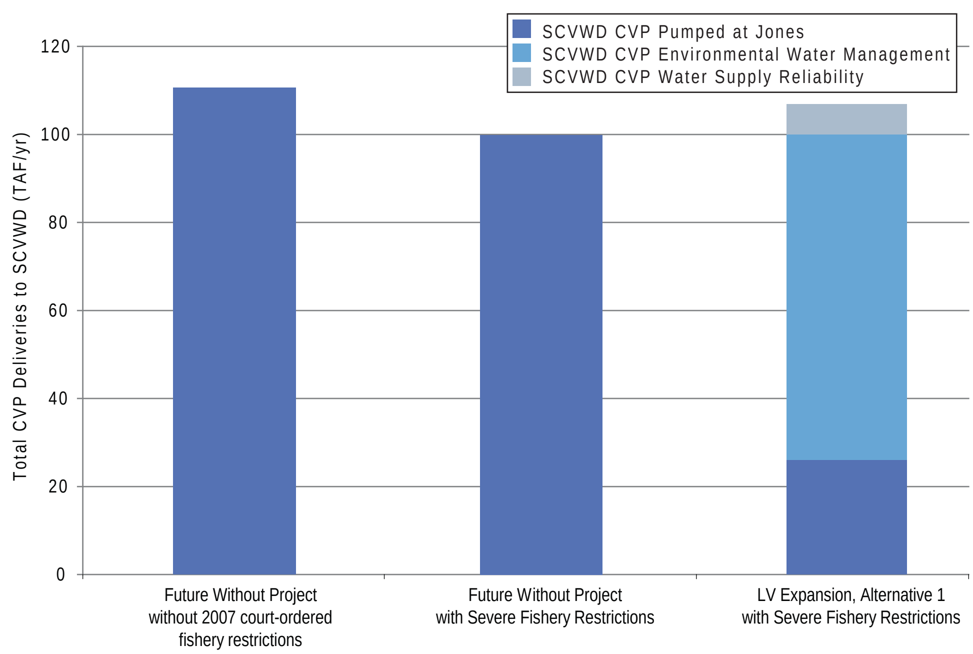
Under Alternative 1, as described in Section 3.4, Action Alternatives, operations to increase water supply reliability would include a combination of Delta Supply Restoration, Dry-Year Storage and Emergency Storage. The water supply reliability and other benefits of Alternative 1 are summarized in Table 4.2-4 in Section 4.2, Delta Hydrology and Water Quality.

Anticipated Future Water Deliveries

With Delta Supply Restoration and Dry-Year Storage operations, direct diversions and stored water supplies would be used to partially offset delivery reductions to the South Bay water agencies that have occurred and are expected to continue to occur due to regulatory restrictions at the SWP and CVP Delta export pumps. As discussed in Section 4.2, two scenarios for future pumping restrictions are evaluated in this EIS/EIR: a moderate fishery restrictions scenario and a severe fishery restrictions scenario. Model studies were also performed without assuming either of these increased levels of restrictions on Delta exports, to estimate Delta export pumping in the future without assuming the 2007 court-ordered fishery restrictions to be in effect. **Figure 4.20-2** illustrates the relationship between modeled Delta exports for South Bay water agencies with and without the Delta fishery restrictions. The severe restrictions scenario is considered in this analysis of growth inducement potential because under this scenario, Alternative 1 has the potential to restore more of the Delta supply deliveries to the South Bay water agencies than under the moderate restrictions scenario.

As shown in Figure 4.20-2, modeling of future conditions without assuming the moderate or severe fishery restrictions on Delta exports shows water contractors on both the SWP and CVP systems would have received more supply from these two water systems in the future (on a long-term average annual basis) than they can now expect with such restrictions in place. Estimated future long-term annual average SWP deliveries to the South Bay water agencies, without the fishery restrictions imposed in 2007 and without the Los Vaqueros Reservoir Expansion Project, would be about 180 thousand acre-feet (TAF). Assuming severe fishery restrictions, future projected long-term annual average SWP deliveries to the South Bay water agencies could be about 130 TAF. As shown in the graph, under Alternative 1, long-term average annual SWP deliveries to the South Bay water agencies would be restored to about 155 TAF. This delivery amount is less than deliveries estimated for the future without the 2007 fishery restrictions. Similarly, projected future long-term annual average CVP deliveries to SCVWD, without the fishery restrictions imposed in 2007 and without the Los Vaqueros Reservoir Expansion Project, were estimated to be about 110 TAF per year, on average, and the assumed severe fishery restrictions reduce the estimated future CVP deliveries to SCVWD to about 100 TAF per year, on average. As shown in Figure 4.20-2, the average annual CVP deliveries to SCVWD would be restored to about 107 TAF in Alternative 1, again less than the deliveries projected for the future without the 2007 fishery restrictions.





SOURCE: CCWD, 2008

Figure 4.20-2
Water Supply Reliability
(2030 Level of Development)

Assuming severe fishery restrictions, Delta Supply Restoration and Dry-Year Storage operations together could provide a long-term annual average benefit of about 30 TAF for the South Bay water agencies and about 25 TAF annually in a 6-year drought. Dry-year storage would also be available to CCWD under this alternative. CCWD's dry-year supply benefit would be up to 20 TAF of stored water at the beginning of a drought. Refer to Section 4.2 for more information on the deliveries made under Alternative 1.

The maximum amount of Emergency Storage that could be available to the Bay Area region under Alternative 1 would be about 210 TAF (under the severe fishery restrictions scenario). This stored water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through either the South Bay Connection or existing interties between water agencies.

Historical Water Deliveries

Table 4.20-1 presents historical total deliveries of Delta water by the SWP to the South Bay water agencies over a 12-year period from 1995 through 2006 (prior to the fishery restrictions imposed in 2007). As shown, total deliveries from the Delta through the South Bay Aqueduct (SBA) to these three agencies over this period ranged from 76.6 TAF to 220.4 TAF, and averaged about 152 TAF. In dry and below-normal years (2001, 2002, and 2004), deliveries averaged about 138 TAF.

TABLE 4.20-1
HISTORICAL SWP DELIVERIES TO THE SOUTH BAY WATER AGENCIES (acre-feet)

		Table A[2]	Total SWP Deliveries by Agency[3]			
Year	**Water Year Type**[1]	**Contract**	**ACWD**	**SCVWD**	**Zone 7**	**Total Deliveries**
1995	Wet	184,000	17,793	30,091	28,756	76,640
1996	Wet	186,000	19,662	18,903	89,850	128,415
1997	Wet	188,000	24,063	27,522	95,601	147,186
1998	Wet	188,000	19,075	17,941	63,410	100,426
1999	Wet	188,000	37,952	48,910	82,945	169,807
2000	Above Normal	210,000	35,978	58,617	101,988	196,583
2001	Dry	220,000	18,004	34,409	77,922	130,335
2002	Dry	220,000	27,811	53,261	62,186	143,258
2003	Above Normal	220,000	36,590	45,450	108,981	191,021
2004	Below Normal	222,619	27,884	52,364	59,458	139,706
2005	Above Normal	222,619	44,599	47,512	128,249	220,360
2006	Wet	222,619	43,079	61,403	74,637	179,119

1 Water year type shown is for the Sacramento Valley.
2 This is the amount of Table A water under contract to the South Bay water agencies; the amount available in a given year varies based on water year type and other factors.
3 Deliveries by Agency show the total amount of water delivered by the SWP to the South Bay water agencies. Deliveries include SWP Contract Table A supplies, Article 21 deliveries, Article 56 deliveries, and other deliveries including transfers, exchanges, and other non-SWP water delivered through SWP facilities.

SOURCE: Compiled by DWR, C. Spencer, 2008.

As shown in Figure 4.20-2, long-term average annual SWP deliveries to the South Bay water agencies under Alternative 1, would be restored to about 155 TAF under the future conditions modeled. This estimated delivery amount is slightly higher than the historical long-term average annual deliveries of 152 TAF of water delivered from the Delta to the South Bay water agencies through the SWP.

Table 4.20-2 presents historical total deliveries by the CVP to SCVWD over the same 12-year period from 1995 through 2006. Deliveries to SCVWD have ranged from about 64.2 TAF to 150.5 TAF, averaging 105 TAF over this period. SCVWD's CVP contract is for 152,500 acre feet and is used to meet both urban and agricultural demand. As for the SWP deliveries described above, estimated deliveries of Delta water to SCVWD through the CVP under Alternative 1 would be slightly higher (107 TAF) than the historical long-term average annual deliveries (105 TAF).

TABLE 4.20-2
HISTORICAL CVP DELIVERIES TO SCVWD (acre-feet)

Year	Water Year Type[1]	Deliveries to SCVWD[2]
1995	Wet	108,603
1996	Wet	100,783
1997	Wet	91,346
1998	Wet	78,679
1999	Wet	116,933
2000	Above Normal	91,372
2001	Dry	150,516
2002	Dry	134,346
2003	Above Normal	106,409
2004	Below Normal	126,631
2005	Above Normal	89,149
2006	Wet	64,230

1 Water year type shown is for the Sacramento Valley.
2 Deliveries to SCVWD show the total amount of water delivered by the CVP to SCVWD and could include transfers, exchanges or other water in addition to contract supply.

SOURCE: USBR Central Valley Operations Office, Reports of Operations, 2008.

Table 4.20-3 presents historical total Delta diversions for CCWD over the 12-year period from 1995 through 2006. CCWD's total Delta diversions have ranged from about 108.4 TAF to 206.5 TAF, averaging about 131.6 TAF over this period. Alternative 1 would provide CCWD with 20 TAF of additional storage for use in drought periods.

Discussion

As summarized in the previous section, Alternative 1 could restore some but not all of the future Delta water deliveries from the SWP and CVP previously expected by the South Bay Water agencies. At this time, the South Bay water agencies have not committed to participating in the project alternatives and have not specified an amount of water to be provided to them. However, for purposes of this impact analysis, it is acknowledged that if one or more of these agencies were to

TABLE 4.20-3
HISTORICAL CVP DELIVERIES TO CCWD (acre-feet)

Year	Water Year Type[1]	CVP Deliveries	Total CCWD Delta Diversions[2]
1995	Wet	93,889	108,805
1996	Wet	105,184	116,841
1997	Wet	113,747	121,555
1998	Wet	88,456	206,461
1999	Wet	83,541	108,421
2000	Above Normal	94,530	128,655
2001	Dry	92,005	114,716
2002	Dry	82,357	127,980
2003	Above Normal	81,579	149,406
2004	Below Normal	93,634	129,820
2005	Above Normal	82,682	136,548
2006	Wet	91,826	129,819

1 Water year type shown is for the Sacramento Valley.
2 Total CCWD Delta Diversions includes the total amount of water delivered by the CVP to CCWD, water transfers, local water rights and diversions of surplus water under CCWD's water rights for the existing Los Vaqueros Reservoir.

SOURCE: CCWD, 2008

participate in Alternative 1, they would receive some improved supply reliability compared to existing and future conditions without the project.

It is not possible to determine exactly how each agency might make use of the water supply reliability benefit provided under Alternative 1. Each of the three South Bay water agencies has multiple sources of supply that they manage to meet the needs of the customers within their service areas. Generally, each agency manages a combination of local surface water and groundwater resources along with surface water supply imported from the Delta. They also each use a combination of surface water and groundwater storage to reserve water supply for drought periods and other times of potential supply shortage.

A review of the Urban Water Management Plans (UWMP) for these three agencies (ACWD, 2005; SCVWD, 2005; Zone 7, 2005) showed that the total projected 2030 water demand in their service areas is: ACWD – 79,100 acre feet (AF); Zone 7 – 69,370 AF; and SCVWD – 448,200 AF, for a total of 596,670 AF. **Table 4.20-4** shows the “normal year” supply from SWP and CVP sources identified in each agency’s 2005 UWMP. A “normal year” is defined as “a year in the historical sequence that most closely represents median runoff levels and patterns. This is the average supply available over the period from 1967 forward, given currently existing facilities and institutional arrangements” (SCVWD, 2005). Review of Table 4.20-4 indicates that the South Bay water agencies anticipate obtaining between 41 percent (ACWD) and 65 percent (Zone 7) of their annual water supply from the Delta in 2030.

TABLE 4.20-4
NORMAL YEAR WATER SUPPLY ANTICIPATED FROM DELTA SOURCES BY WATER DISTRICT

	Normal Year 2010 (acre-feet)	Percentage of Respective Agency Supply	Normal Year 2030 (acre-feet)	Percentage of Respective Agency Supply
Alameda County Water District	32,700	40%	36,000	41%
Zone 7	63,900	70%	60,900	65%
Santa Clara Valley Water District	197,400	52%	197,400	44%
Total Anticipated Future Delta Supply for South Bay water agencies	**294,000**		**294,300**	
Contra Costa Water District	211,500	89%	213,000	89%

SOURCE: Contra Costa Water District 2005 UWMP; Alameda County Water District 2005 UWMP; Zone 7 2005 UWMP; SCVWD 2005 UWMP; ESA 2008.

As shown in Table 4.20-4 the South Bay water agencies anticipate receiving about 294 TAF of Delta water in 2030. The estimate of Delta deliveries to South Bay water agencies shown in Figure 4.20-2 without assuming moderate or severe Delta fishery restrictions is about 290 TAF at the 2030 level of development (about 180 TAF through the SBA system, plus 110 TAF through the CVP system). The modeling estimate of future deliveries of 290 TAF per year for Delta water supply among the South Bay water agencies is slightly lower than that projected in the UWMP for these agencies, but is approximately comparable.

Alternative 1 could restore, on average, about 30 TAF of Delta supply to the three South Bay water agencies. This represents about 10 percent of the total Delta supply these agencies had been expecting from Delta supply sources (294.3 TAF), as reflected in their current UWMPs, and about 5 percent of their total water demands (596.7 TAF). Alternative 1 would not provide these agencies with a new source of water or an amount beyond that which they had previously planned to receive. However, on average, this alternative would provide slightly more water than the average annual amount these agencies historically had received.

During a drought, this additional water could reduce the amount of supplemental water or the level of demand reduction necessary. The supply restoration provided under Alternative 1 would not be substantial and is well within the range of demands and supplies for which there are current approved plans.

Alternative 1 would provide 20 TAF of additional storage to CCWD at the beginning of a drought. With this additional dry-year supply, CCWD could reduce its purchase of supplemental supplies and could reduce the severity of drought management (rationing) measures imposed on its customers. In 1996, the CCWD Board of Directors adopted the Future Water Supply Study (described in Chapter 2), including a preferred alternative to provide their customers a high-quality, reliable supply of water through 2040. The preferred alternative included continued reliance on the CVP, conservation, recycling, and water transfers. In 2002, the Future Water Supply Study was updated and extended through 2050. A key goal of the Future Water Supply Study implementation plan is to meet 100 percent of demand in all but the driest years, and to meet at least 85 percent of normal year demands in a drought. The remaining 15 percent of demand would be met through demand management, including mandatory rationing, transfers, and spot market water purchases. The additional 20 TAF from Alternative 1 would enable CCWD to reduce rationing requirements, transfers, and/or spot market water purchases during a drought.

CCWD certified a programmatic EIR on its Future Water Supply Implementation in 1999 and received a biological opinion from USFWS in 2000 covering the secondary effects of growth related to implementation of the Future Water Supply Study. The dry-year water supplied to CCWD from Alternative 1 is consistent with the Future Water Supply Study, the Future Water Supply Implementation EIR and the related USFWS Biological Opinion.

Emergency storage does not have a growth-inducing potential because it would not be used to meet the demands of any particular agency or area, but rather would be made available in the event of a natural disaster or other emergency based on needs and conditions specific to the emergency.

Alternative 2

Under Alternative 2, operations to increase Water Supply Reliability would include Dry-Year Storage and Emergency Storage. It does not include a specific increment of water for Delta Supply Restoration as under Alternative 1. Operating Alternative 2 for Dry-Year Storage would increase the amount of water available to CCWD in dry years by up to 20 TAF at the start of a drought. About 200 TAF of emergency storage would be available to the Bay Area region under Alternative 2, assuming severe fishery restrictions. This water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through either the South Bay Connection or existing interties between water agencies.

Alternative 2 does not include the Delta Supply Restoration operation and does not have the potential to induce growth in the South Bay water agencies' service areas. The analysis and conclusions regarding the potential for the Dry-Year Storage operation to affect growth in the CCWD service area are the same as presented for Alternative 1.

Emergency storage does not have a growth-inducing potential because it would not be used to meet the demands of any particular agency or area, but rather would be made available in the event of a natural disaster or other emergency based on needs and conditions specific to the emergency.

Alternative 3

Under Alternative 3, operations to increase Water Supply Reliability would include only Dry-Year Storage and Emergency Storage operations with no increment of water from Delta Supply Restoration operations as provided under Alternative 1. Operating for Dry-Year Storage would increase the amount of water available to CCWD in dry years by up to 20 TAF at the start of a drought. About 220 TAF of emergency storage would be available to the Bay Area region under Alternative 3, assuming severe fishery restrictions. This water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through existing interties between water agencies.

Alternative 3 does not have the South Bay Connection and does not have the potential to induce growth in the South Bay water agencies' service areas. The analysis and conclusions regarding the potential for the Dry Year Storage operation to affect growth in the CCWD service area are the same as presented for Alternative 1.

Emergency storage does not have a growth-inducing potential because it would not be used to meet the demands of any particular agency or area, but rather would be made available in the event of a natural disaster or other emergency based on needs and conditions specific to the emergency.

Alternative 4

Under Alternative 4, operations to increase Water Supply Reliability would include Dry-Year Storage and Emergency Storage. Operating for Dry-Year Storage would increase the amount of water available to CCWD and other participating Bay Area water agencies to which CCWD can deliver water directly through interties or indirectly by exchange. The increase in available water would be as much as 60 TAF at the start of a drought. About 115 TAF of emergency storage would be available to the Bay Area region under Alternative 4, assuming severe fishery restrictions. This water would be available during shortages caused by natural disasters or other emergencies. Emergency water supplies would be delivered through existing interties between water agencies.

As described above for Alternative 1, CCWD is implementing its Future Water Supply Study, relying on CVP supplies, conservation, recycling, and water transfers to meet future demand. CCWD's goal, according to the Future Water Supply Study, is to meet 100 percent of demand in all but the driest years and to provide at least 85 percent of demand in a drought. The 60 TAF of dry-year supply storage provided to CCWD under Alternative 4 would reduce the extent to which CCWD would need to acquire water transfers to meet future demand in both normal and drought conditions, and would reduce the need for rationing and spot market purchases during droughts. The dry-year water supplied to CCWD from Alternative 4 is consistent with the Future Water Supply Study, the Future Water Supply Implementation EIR, and the related USFWS Biological Opinion.

Emergency storage does not have a growth-inducing potential because it would not be used to meet the demands of any particular agency or area, but rather would be made available in the event of a natural disaster or other emergency based on needs and conditions specific to the emergency.

4.20.3 Secondary Effects of Growth

The water supply reliability provided by Alternative 1 would restore some amount of the water the South Bay water agencies had previously expected and planned to receive from the Delta in the future under their existing contracts with the state and federal water agencies. In addition, all project alternatives would provide additional water reliability to CCWD. Each of these agencies has prepared a long-term future water supply plan; Delta water supply is a central component in each. These long-term water supply plans have been designed to provide adequate water supply to meet the needs of both existing customers and the growth that has been planned in each service area by the respective city and county land use agencies. These plans identify water supplies needed in the future to provide for both normal-year water demands as well for drought periods and include the following:

- ACWD, Integrated Resource Plan and 1996-2001 Capital Improvements Program, 1998.
- ACWD, Urban Water Management Plan, 2005.
- CCWD, Future Water Supply Implementation, 1999.
- CCWD, Urban Water Management Plan, 2005.
- SCVWD, Integrated Water Resources Planning Study 2003, Adopted December 2005.
- SCVWD, Urban Water Management Plan, December 2005.
- SCVWD Water Utility Enterprise Report – Annual Report on the Protection and Augmentation of the Water Supplies of the District, October 2007.
- Zone 7 Water Agency, 2008/09 Capitol Improvement Program, Ten-Year Water System Plan, Five-Year Flood Control System Plan, Adopted October 17, 2007.
- Zone 7 Water Agency, Urban Water Management Plan, 2005.

Water that could be provided to these agencies is reflected in the adopted land use plans for the areas to be served. The potential environmental effects of this future planned growth have been evaluated and fully disclosed previously in the CEQA environmental documents prepared on the long-term water supply plans for the South Bay water agencies and CCWD.

- ACWD, Integrated Resources Plan and 1996-2001 Capital Improvement Program, May 15, 1998, State Clearinghouse # 97122003.
- CCWD, Future Water Supply Implementation Final EIR, January 22, 1999, State Clearinghouse # 97072064.
- Zone 7 Water Agency, Water Supply Planning Program Draft EIR, January 1999.

CHAPTER 5
Climate Change

5.1 Introduction

5.1.1 Chapter Overview

This chapter presents a discussion of climate change – what it is and its potential environmental consequences as understood to date – with a focus on climate change issues that are relevant to the Los Vaqueros Reservoir Expansion Project. Two general areas of inquiry are the focus of this discussion:

- To what extent would the project contribute to the global greenhouse gas (GHG) emissions that are causing climate change?
- Would the project be adversely affected by the environmental changes projected to result from climate change and/or would the project contribute to the adverse effects of climate change?

Whether the project will contribute to GHG emissions is an air quality issue and, therefore, is analyzed in Section 4.10, Air Quality, of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The second area of inquiry, the extent to which the project affects or is affected by the projected environmental consequences of climate change, centers on potential changes to water resources, water supply, and water quality.

5.1.2 Overview of Climate Change

Various gases in the earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters earth's atmosphere from space, and a portion of the radiation is absorbed by the earth's surface. The earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. GHGs are transparent to solar radiation and, therefore, are effective in absorbing infrared radiation. As a result, radiation that otherwise would escape back into space is retained, resulting in a warming of the earth's atmosphere. This phenomenon is known as the GHG effect.

Scientific research to date indicates that observed climate change is most likely a result of increased emission of GHGs associated with human activity (Intergovernmental Panel in Climate Change, 2007a, 2007b). Among the prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), ozone (O_3), water vapor, nitrous oxide (NO_x), and chlorofluorocarbons (CFCs). Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for enhancing the greenhouse effect. GHG emissions contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential and agricultural sectors (CEC, 2006). In California, the transportation sector is the largest emitter of GHGs (accounting for 40.7 percent of the total GHG emissions in the state in 2004), followed by electricity generation (CEC, 2006).

As the name indicates, global climate change is a global problem. GHGs are global pollutants, unlike criteria air contaminants and toxic air contaminants, which are pollutants of regional and local concern, respectively. If California were a country, it would rank between the 12th and 16th largest emitter of CO2 in the world. California produced 492 million gross metric tons of carbon dioxide equivalents[1] in 2004 (CEC, 2006).

California is taking actions to reduce GHG emissions. Governor Schwarzenegger signed Executive Order S-3-05 in June 2005 to address climate change and GHG emissions in California. This order sets the goal that GHG emissions be reduced as follows:

- To 2000 levels by 2010
- To 1990 levels by 2020, and
- To 80 percent below 1990 levels by 2050

In 2006, California passed the California Global Warming Solutions Act of 2006 (AB 32; California Health and Safety Code Division 25.5, Sections 38500, et seq.). This Act requires the California Air Resources Board (CARB) to design and implement emission limits, regulations, and other feasible, cost-effective measures to reduce statewide GHG emissions to 1990 levels by 2020 (representing an approximate 25 percent reduction in emissions).

Global climate change will affect water resources in California. Rising temperatures will result in sea-level rise and perhaps the timing and amount of precipitation, which, in turn, could alter water quality. Climate change is also expected to result in more extreme weather, both heavier precipitation that can lead to flooding as well as more extended drought periods. Although much uncertainty remains regarding the timing, magnitude, and nature of potential changes to water resources as a result of climate change, several trends are evident. Thus, it is valuable to evaluate projects such as the Los Vaqueros Reservoir Expansion Project in light of these potential changes in water resource conditions.

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[1] Carbon dioxide equivalents (CO_2E) are measurements used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, methane is a much more potent GHG than CO_2. As described in the General Reporting Protocol of the California Climate Action Registry, one ton of CH_4/methane contributes as much to the greenhouse effect as approximately 21 tons of CO_2/carbon dioxide (California Climate Action Registry, 2006). Expressing all GHG emissions in carbon dioxide equivalents converts them to a common unit of measurement calculated as if only CO_2 were being emitted.

5.2 Potential Changes to California's Water Resources

Focusing on precipitation, snow pack, runoff, flooding, and sea-level rise, the following text describes the potential for climate change to affect California's water resources.

5.2.1 Precipitation, Snowpack, and Runoff

Amount of Precipitation

Most precipitation events in California occur during the October through April rainy season with the largest amount of water falling during November through March. An analysis by the U.S. National Weather Service (USNWS) using data from 1931 through 2005 indicates a long-term trend of increasing annual precipitation in California, especially in northern California, where data show an increase of up to 1.5 inches per decade (USNWS, 2008). A second investigation completed by the California Department of Water Resources (DWR) indicates a statistically significant trend towards increased total precipitation in northern and central California since the late 1960s (DWR, 2006). A single investigation by Bardini and others (Bardini, et al., 2001) shows a trend of potentially decreasing annual precipitation in California; however, this result is probably related to the specific subset of data that the Bardini study relied upon, wherein extremes at the beginning or end of time series data can substantially impact the identified trend (DWR, 2006). An investigation of rainfall during November through March of 1930 through 1997 indicates significant increases in California rainfall (distinct from snowfall) (Mote, 2005).

There is also evidence that the amount of precipitation that occurs on an annual basis is becoming more variable. That is, periods of both high and low rainfall are becoming more common. Specifically, a study performed by DWR indicates that present-day variability in annual precipitation is about 75 percent greater than that of the early 20th century (DWR, 2006). The effects of these trends on the project along with trends resulting from climate change scenarios are discussed in the following subsections.

Snowpack and Snowmelt

In addition to potentially increased precipitation, snowpack and snowmelt may also be substantially affected by climate change. Because much of California's precipitation falls as snow in the Sierra Nevada and southern Cascades, the state's snowpack represents a significant reservoir of usable water. Specifically, about 35 percent of the state's usable annual surface water supply is derived from the annual snowmelt (DWR, 2006). This snowmelt typically occurs from April through July, providing natural water flow to streams and reservoirs after the annual rainy season has ended. Estimates by DWR further indicate that California's snowpack contributes, on average, about 14 million acre feet (MAF) per year of runoff to watersheds that flow into the Central Valley and Delta (DWR, 2006). For comparison, total reservoir capacity in the Central Valley is about 24.5 MAF per year (DWR, 2005a).

As air temperatures increase due to climate change, the water stored in California's snowpack could be affected in two ways: first, increasing temperatures could result in decreased snowfall, and second, increasing temperatures could result in earlier snowmelt. Several investigations of current and potential future snowfall trends in California illustrate these effects. Knowles and Cayan performed a model analysis of the portion of the California snowpack that feeds Delta watersheds. The study estimates that, by 2060, California's snowpack will be reduced substantially, especially within northern and eastern areas of the Sacramento River watershed (Knowles and Cayan, 2004). A recent study by the Scripps Institute of Oceanography estimates trends in snowpack, river runoff, and air temperatures in California and Oregon. Consistent with other studies, this investigation also indicates a substantial reduction in snowpack in California concurrent with an increase in winter rainfall (Scripps Institute of Oceanography, 2007).

Runoff

Runoff may be considered in terms of annual or peak runoff volumes. Annual runoff is measured during the annual water year (October 1st through September 30th) and includes river flows derived from precipitation events, snowmelt, and river base flow. Peak runoff is typically measured for individual storm events. Like annual runoff, peak runoff results from precipitation events, snowmelt, and river base flow. However, most of the water mass present during a peak runoff event is typically derived from concurrent precipitation and snowmelt.

As discussed above, precipitation across California appears to have increased over the past century, and the amount of precipitation that occurs in individual water years has become more variable. It follows, then, that similar trends would be seen for runoff. A study by DWR compares pre- and post-1955 annual average water year unimpaired runoff[2] for 24 watersheds across northern, central, and southern California (DWR, 2006). Data indicate an annual increase in runoff of up to 27 percent for 21 of the 24 watersheds, with an overall average increase of 9 percent. The remaining three watersheds – the Mokelumne, Stanislaus, and American Rivers – show runoff reductions of 1 to 2 percent.

The DWR study also addresses the amount of variability in runoff volumes among water years for the Sacramento and San Joaquin River watersheds. Results indicate a statistically significant increase in variability within the Sacramento River watershed, and an insignificant but increasing trend within the San Joaquin River watershed. Thus, the annual amount of runoff in the Sacramento River is becoming increasingly variable, and annual runoff in the San Joaquin may follow a similar trend (DWR, 2006).

In relation to snowpack, winter storms produce snow to higher elevations than other storms, snow that has historically melted during April through July. This process effectively stores water in California's snowpack until the spring snowmelt when the water flows downstream into major rivers and reservoirs, providing a significant portion of the water supply for the dry summer and autumn. April through July runoff in both the Sacramento and San Joaquin Rivers shows a

2 Unimpaired runoff refers to the runoff water that occurs within a river above major regulating impoundments (e.g., major dams).

decreasing trend over the last century, indicating that, in both watersheds, an increasing percentage of runoff is occurring earlier in the year when many reservoirs are managed primarily for flood control and not for water supply (DWR, 2006).

These changes in the timing of precipitation and runoff, and in the amount of water stored in California's snowpack, have significant implications for the management of water resources in the state. These effects are discussed in greater detail below.

5.2.2 Flooding and Flood Management

As discussed above, it is anticipated that climate change will have a substantial effect on the timing and magnitude of snowfall, rainfall, and snowmelt events in California. Large annual variations in winter rainfall and runoff, which are normal in California, create uncertainty about climate change's potential to affect flooding. Still, based on more than a century of historical data and global and local-scale climate modeling efforts, a few generalities have emerged.

In terms of flooding, a peak flow analysis of three Delta tributaries was completed (DWR, 2006). The Feather, American, and Tuolumne Rivers were selected for their century-long, 3-day peak flow records. The investigation divided in half a century-long dataset to compare pre-1955 to post-1955 data. Results indicated that the 100-year 3-day peak flows have more than doubled in the American (111 percent increase) and Tuolumne (102 percent increase) Rivers, and increased by 51 percent in the Feather River. Comparing the pre- to post-1955 periods, only one major flood event occurred prior to 1955 in the three rivers, while four occurred during the post-1955 period. Thus, annual peak 3-day mean discharges in Central Valley watersheds are becoming larger and more variable. Independent climate modeling efforts (Dettinger, et al., 2004; Miller, et al., 2003), predict that these trends towards more variable river flows and more frequent flooding events will continue as a result of climate change.

5.2.3 Sea-level Rise

According to DWR, mean sea level at the Golden Gate Bridge has risen by at least 8 inches since 1900 (DWR, 2006). This corroborates a report by the Intergovernmental Panel on Climate Change (IPCC), which indicates average increases of 3.9 to 7.9 inches globally during the last century (IPCC, 2007a). The observed sea-level rise likely results from a combination of factors, including melting of polar and terrestrial ice and snow, and thermal expansion of ocean water as the earth's temperature has increased (IPCC, 2007b).

Efforts have also been made to predict the amount of sea-level rise likely to occur in the future under various worldwide GHG emissions scenarios. A 2007 IPCC report provides estimates of potential sea-level rise over the next century. That study indicates that global sea level could increase by an estimated 7 to 23 inches by 2099, or about 0.6 to 3.8 inches per 10 years (IPCC, 2007b). There is some disagreement and uncertainty about sea-level rise projections (Munk, 2002); however, the 2007 IPCC report is probably the most highly regarded study on the subject.

5.2.4 Implications for Los Vaqueros Reservoir Expansion Project

The project's expanded Old River Intake and Pump Station and the new Delta Intake and Pump Station would be in the Delta along Old River. This area would potentially be subject to increased flow of water from upstream areas as a result of flooding in the watershed's tributary to the Delta. These increased flood flows, in combination with sea-level rise discussed above that could occur as a result of climate change, could result in increased frequency of high water within the Delta.

However, the new Delta Intake and Pump Station would be designed to withstand projected high-water flood flows. Design of existing and future facilities incorporates the likelihood of high water levels increasing by over 3 feet; should water levels rise even higher, the facilities could be modified to accommodate them. Neither the expanded Old River Intake and Pump Station nor the new intake structure would significantly impede or redirect flood flows through the Delta because neither protrudes significantly into existing channels.

As discussed above, climate change could increase the frequency or severity of flooding within California. The Kellogg Creek watershed, as well as other minor tributaries to the Los Vaqueros Reservoir, could therefore receive increased flood flows during storm events, and these local storm flows would be collected in the expanded Los Vaqueros Reservoir. As discussed in Section 4.5, Local Hydrology, Drainage, and Groundwater the existing Los Vaqueros reservoir is sized and designed appropriately to either contain flood flows from Kellogg Creek and other minor tributaries to the reservoir, or release those flows downstream.

While the Los Vaqueros Reservoir is designed to function primarily as a water storage facility, expansion of the existing reservoir would provide additional capacity to withhold increases in future flood flows within the Kellogg Creek watershed. Under dam safety regulations, just as the existing reservoir has adequate water storage above its maximum levels to contain and hold the probable maximum flood, the expanded reservoir would also be required to have such capacity. Should future studies indicate a larger flood is probable as a result of climate change, the reservoir operations in winter would be adjusted to retain larger flood flows.

Setback levees surrounding the pump stations are designed and engineered to modern standards and incorporate features that make them far less likely to fail than typical Delta levees. Consequently, flooding caused by failure of levees on Byron Tract or Victoria Island is unlikely to affect the pump stations. Pipelines on islands and tracts subject to flooding are designed to allow access for maintenance, should that be necessary, under flood conditions on the islands. Both Byron Tract and Victoria Island house infrastructure of statewide importance and, in the case of Byron Tract, include a significant number of inhabitants. Consequently, neither Byron Tract nor Victoria Island is likely to be abandoned should it flood.

The expanded Old River Intake and Pump Station and the proposed new Delta Intake and Pump Station would be along Old River in an area that would potentially be subject to a projected climate-induced sea-level rise of about 1 to 3 feet (DWR, 2006). Intake facilities would be designed to withstand inundation and be installed at a height above the potential inundation level. Sea-level rise would not be expected to have a significant effect on the proposed intake and pumping facilities. During the project design phase, project engineers will address the most current information regarding potential sea-level rise and will design pumps and other infrastructure to endure higher flood levels.

Portions of the Delta-Transfer Pipeline would lie within areas that are presently in the 100-year flood zone, as shown on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM). These areas would be potentially subject to additional Delta flooding associated with a rise in sea level. However, the Delta-Transfer Pipeline would be buried underground, so that flooding, if it did occur, would not disturb, obstruct, or otherwise damage the pipeline. The Transfer-LV Pipeline alignment would reach elevations above 150 mean sea level (msl) and, therefore, would not be in the portion of the project area potentially affected by sea-level rise or associated flooding.

The potential effects of sea-level rise on Delta water quality are discussed in subsection 5.3.2.

5.3 Potential Effects on Water Supply and Water Resources Management

The following text discusses existing climate change research and the potential for climate-induced effects to alter water management within California's natural and managed water environment.

5.3.1 Effects on the State Water Project and Central Valley Project

Reports by the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) and DWR, prepared in response to Executive Order S-3-05, represent the latest complete analysis of changes to State Water Project (SWP) and Central Valley Project (CVP) operations that are likely to occur as a result of climate change. Reclamation prepared *Sensitivity of Future Central Valley Project and State Water Project Operations to Potential Climate Change and Associated Sea Level Rise,* Appendix R of the *Operations and Criteria Plan (OCAP) Biological Assessment* (Reclamation, 2008). DWR wrote the Technical Memorandum Report *Progress on Incorporating Climate Change into Management of California's Water Resources* (DWR, 2006) and *The State Water Project Delivery Reliability Report, 2007* (DWR, 2008).

Contained in these reports is an analysis of the potential impacts of climate change on SWP and CVP operations and deliveries, as well as on Delta water quality and water levels. The analysis is based on runs of the CalSim II and DSM2 models, which are described in more detail in Section 4.2, Delta Hydrology and Water Quality. The specific CalSim II and DSM2 methodology used for the climate change analysis is detailed in the first-mentioned DWR report (DWR, 2006).

Results discussed in the reports include projections from 2035 through 2064 in four potential climate change scenarios compared to a base case scenario that does not assume climate change effects. The four potential climate change scenarios were based on modeling output from two separate global climate models (**Table 5-1**). Three of these scenarios presumed decreased average annual precipitation, while one assumed increased average annual precipitation. Results from the investigations are considered preliminary, incorporate several assumptions regarding the effects of climate change on California water resources, and reflect a limited number of climate change scenarios.

TABLE 5-1
PRECIPITATION PROJECTIONS FOR THE FOUR CONSIDERED CLIMATE CHANGE SCENARIOS

	Average Change in Precipitation (in/yr)	
Climate Scenario[a]	**Northern California**	**Southern California**
2050 GFDL A2	-0.75	-0.22
2050 PCM A2	-0.25	-1.77
2050 GFDL B1	-0.62	0.7
2050 PCM B1	0.83	-0.08

[a] The four climate scenarios DWR investigated were chosen from among several available scenarios compiled for the United Nations' Intergovernmental Panel in Climate Change's (IPCC's) Fourth Assessment Report. The four climate changes scenarios consist of two GHG emissions scenarios, A2 and B1. Each of the GHG emissions scenarios is represented by two different Global Climate Models, the Geophysical Fluid Dynamic Lab model (GFDL) and the Parallel Climate Model (PCM). Climate scenarios were modeled on a 2050 timeframe.

SOURCE: DWR, 2006

Results from the four modeled scenarios indicate effects to SWP and CVP operations. Because of shifts in seasonal and annual average runoff, the amount of water delivered by the SWP and CVP was reduced considerably. Under three of the four climate change scenarios, reservoir water levels were drawn to the minimum level (dead storage) during 21 to 31 months for Shasta, and 20 to 28 months for Folsom during the period of record, as compared to 1 month for each reservoir under a scenario without climate change. During these months, streamflow requirements were not predicted to be met on the Sacramento and American Rivers, and the CVP would not be able to contribute to its Coordinated Operation Agreement-defined share of in-basin use. However, it is thought that these are modeling artifacts; DWR suggests that these results would be avoided by making carryover storage allocations more conservative within the CalSim II model. Still, the overall projected trend shows a decrease in water availability within the system (DWR, 2006).

SWP Deliveries

As discussed above, climate change would generally increase the amount of runoff that occurs during winter and early spring and reduce the amount of runoff during late spring and early summer. Results from the DWR investigations show that these changes would make it more difficult to capture water in SWP and CVP facilities for delivery later in the year. Specifically, average annual deliveries to contractors could be reduced by 7 to 10 percent under three of the four scenarios, and increased by 1 percent under the remaining scenario. In general, drought-year only deliveries could also be reduced for three of the four scenarios, in comparison to the base case. Reclamation studies (Reclamation, 2008) that included both sea-level rise and four climate scenarios arrived at generally the same conclusions: depending on the scenario, changes in SWP deliveries could range from +7 percent (wetter scenarios) to -15 percent (drier scenarios).

SWP Carryover Storage

Carryover storage is defined as the volume of water that remains in a given reservoir after all annual deliveries and releases have been fulfilled. Carryover storage can then be used during the following water year to supplement water supply in case of drought. DWR analyzed SWP carryover storage as the sum of Oroville and SWP storage in San Luis Reservoir on September 30th, a date that coincides with the end of the water year. Results indicate that carryover storage would be consistently lower under three of the four climate change scenarios, with reductions of about 10 percent at the 90 percent exceedance probability level,[3] to reductions of up to 28 percent at the 10 percent exceedance probability level. Results for the remaining fourth scenario indicate slightly increased carryover storage during below normal, dry, and critical water years, and slightly decreased carryover storage during above normal and wet water years (DWR, 2006).

CVP South of Delta Deliveries

Deliveries by the CVP to South of Delta (SOD) contractors were also affected under each of the four climate change scenarios. Under the three drier scenarios, DWR found that annual average CVP SOD deliveries would be reduced by 6 to 10 percent, likely resulting from generally drier conditions and a shift towards reduced April-July runoff and increased winter season runoff under these scenarios (DWR, 2006). The wetter scenario still exhibited increased winter season runoff and decreased April-July runoff but resulted in a 3 percent average annual increase in CVP SOD deliveries. Reclamation studies that included both sea-level rise and four climate scenarios came to generally the same conclusions: depending on the scenario, changes in CVP deliveries could range from +4 percent (wetter scenarios) to -12 percent (drier scenarios) (Reclamation, 2008).

CVP Carryover Storage

DWR found that changes in CVP carryover storage, defined as the sum of Trinity, Shasta, Folsom, and CVP storage in San Luis Reservoir on September 30th, would be similar to those described for SWP carryover storage. Specifically, results indicate that carryover storage would be consistently lower under three of the four climate change scenarios, with reductions of about 26 to 47 percent at the 90 percent exceedance probability level, and reductions of 4 to 15 percent at the 10 percent exceedance probability level. The fourth, wetter climate change scenario resulted in an increase of 9 percent at the 90 percent exceedance probability level, and a

[3] Exceedance probability for carryover storage is the percent chance of surpassing a specific volume of remaining carryover storage. For instance, under the base case scenario modeled by DWR (2006), there is a 90 percent chance that carryover storage during a given year will exceed 1,300,000 acre feet (AF). This means that the probability of exceedance for 1,300,000 AF of carryover storage is 90 percent, and only during 10 percent of years (the driest years) would there be less than 1,300,000 AF of carryover storage.

slight reduction of less than 1 percent at the 10 percent exceedance probability level (DWR, 2006). Reclamation studies indicate a similar range of carryover storage (Reclamation, 2008).

5.3.2 Effects on the Delta

Making use of CalSim II and DSM2 modeling exercises, DWR also analyzed the potential effects of climate change on the Delta. Details regarding this modeling analysis and underlying assumptions for the CalSim II and DSM2 models can be found in the DWR report (DWR, 2006).

Delta Inflow and Delta Outflow

Delta inflow is defined as the volume of water that flows into the Delta from a combination of the Sacramento, San Joaquin, and east-side Rivers. Delta inflow is important to Delta operations since, during dry summer and autumn periods, Delta water quality and flows must be sustained by either reducing Delta exports or increasing upstream releases. Additionally, the permitted pumping capacity at the SWP Banks Pumping Plant depends on inflow to the Delta from the San Joaquin River, from December 15th through March 15th. Under the three drier climate change scenarios, annual average Delta inflow would decrease by 3 to 4 percent in comparison to the base case scenario. Under the wetter climate change scenario, annual average Delta inflow would increase by 5 percent.

Considered on a monthly basis, average Delta inflow under all four climate change scenarios would increase, relative to the base case scenario, during December through March. This increase corresponds to increased rain and decreased snow events during this period, which results in additional flood control releases from upstream reservoirs and, therefore, greater Delta inflow. Conversely, under the three drier climate change scenarios, inflows from the Sacramento River to the Delta would decrease overall in comparison to the base case.

Delta outflow is defined as the volume of water that exits the Delta via the San Francisco Bay. Delta outflow helps maintain acceptable salinity levels within the Delta, facilitating pumping at state, federal, and local water project pumps, as well as maintaining Delta water quality. Under the three drier scenarios, CalSim II modeling indicates that there would be no reduction in required Delta outflow, but that there would be a 0 to 4 percent reduction in total Delta outflow (including surplus Delta outflow). The wetter climate change scenario would result in an overall increase in total Delta outflow of about 6 percent.

Delta Exports

Exports from the Banks and Tracy Pumping Plants and into the SWP and CVP, respectively, are considered together in DWR's CalSim II analysis of Delta exports. The modeling results indicate that total average annual changes in Delta exports to the two water systems combined would be reduced by 6 to 10 percent for the three drier climate change scenarios, and would increase by 2 percent under the wetter climate change scenario. On a monthly basis, average winter month exports under all four climate change scenarios would not be significantly changed, as compared to the base case scenario. Conversely, during July through November, monthly average Delta exports would be reduced by up to about 20 percent for the three drier climate change scenarios. During most non-winter months, the wetter climate change scenario would not result in any substantial differences from the base case scenario.

DWR has updated its 2006 water supply reliability studies and has included current fishery restrictions on export pumping that were previously excluded. This latest modeling included moderate and severe fishery restrictions and several future climate model scenarios. The results of the updated modeling show that future climate conditions would have a smaller effect on operations than the previous studies indicated. Namely, depending on the climate scenario, average deliveries under future conditions would be slightly higher or about the same as those under current conditions. Overall, anticipated deliveries were reduced compared to the 2005 studies for both current and future conditions, largely due to the increased fishery restrictions (DWR, 2008). The results of the 2008 update are consistent with the studies used for the analysis of the project provided in this Draft EIS/EIR.

Sea-level Rise and Delta Water Quality

The greatest effect of sea-level rise on California’s water supply would most likely occur in the Delta (DWR, 2005b). Specifically, rising sea levels in the vicinity of below-sea-level Delta islands would place additional stress and pressure on the Delta’s existing levee system, potentially leading to more frequent overtopping and levee failures. Additionally, higher sea levels would push saltwater up into the Delta, potentially degrading freshwater quality at state, federal, agricultural, and local municipal pumping facilities. To offset increased salinity intrusion, Delta pumping could be curtailed, or upstream reservoir releases could be increased.

DWR conducted a preliminary modeling effort to evaluate potential impacts on Delta water quality. The DSM2 modeling study investigated how a 1-foot rise in sea level would affect Delta water quality. The model did not account for potential CVP or SWP operational changes. Results show an increase in salinity within the Delta under the 1-foot rise scenario, although this change is attributed largely to an assumed increase in the tidal range, not the overall mean sea-level rise (DWR, 2006). Whether or not to anticipate an increase in tidal range with sea-level rise is under further investigation. Still, chloride concentrations along Old River at Rock Slough were assumed to be below the 250 mg/L threshold during about 90 percent of the modeled period.

Under real-time conditions, releasing additional water from SWP and CVP reservoirs would offset increases in Delta salinity. Thus, water quality standards would be met but, during those times when additional water releases were not necessary to meet a standard, water quality would be degraded incrementally as a result of seawater intrusion. This, in turn, would incrementally degrade Delta water quality for drinking water purposes. Increasing reservoir releases to maintain Delta water quality could also affect supply reliability.

Sea-level Rise and Levee Overtopping

The DWR investigation included a preliminary analysis of the potential for levee overtopping under a scenario of a 1-foot increase in sea level. Three Delta islands – Sherman Island, Twitchell Island, and Jersey Island – were specifically considered in the analysis. These islands were selected due to their proximity to the ocean and vulnerability to overtopping should the sea level rise. Results of the DSM2 model, with its assumption of a 1-foot sea-level rise, show an increase in potential overtopping events from zero under the simulated base case scenario to two at a series of five low points along the levees of the Delta islands considered (DWR, 2006).

The model does not account for increased variability of inflows to the Delta from upstream sources or for the effects of wave action. However, both overtopping events occurred in the model during historically high water levels. Flooding of the islands could result in significant seawater intrusion if it occurs in dry periods, possibly making Delta water undrinkable for an extended period of time. If the levees were to be abandoned and not repaired, the resulting increase in surface water in the western Delta would result in permanent increased salinity intrusion. By contrast, permanently flooding interior islands would reduce seawater intrusion on a permanent basis.

Adaptive Management Approaches

Current research generally indicates that the most probable impacts of climate change on water resources would be related to increased peak winter flows and decreased spring and early summer runoff. As discussed above, these changes in water flow would result in less water available for capture through the CVP and SWP, as well as through other local water projects and diversions. Without substantial changes in water management, it is, therefore, likely that climate change could lead to reduced deliveries to water contractors north and south of the Delta who rely on water supplies from the SWP, the CVP, and local sources.

Climate change most likely would reduce spring and early summer snowmelt, while increasing water discharged during winter months, from the standpoint of water supply, it would be useful to have additional screened, winter pumping capacity in the Delta. Such additional pumping capacity would facilitate retention and storage of storm season flood flows. Accordingly, DWR concluded that the key constraint to increasing winter withdrawals of Delta water is permitted and physical capacity at the Banks Pumping Plant for the SWP (DWR, 2006). CVP exports from the Tracy Pumping Plant have often been limited by the upper Delta Mendota Canal constriction, although the California Aqueduct-Delta Mendota Canal intertie could potentially be used to provide additional water supply from the SWP's California Aqueduct to the CVP's Delta Mendota Canal.

Additional permitted or physical, screened pumping plant capacity, along with supplemental SWP SOD conveyance capacity (surface storage, canals, pumps, and groundwater banking) and changes in management of the California Aqueduct-Delta Mendota Canal intertie, would potentially alleviate the reduced water supply that would result from climate change. Increasing the ability of water managers to adaptively manage Delta withdrawals and SOD storage would permit more effective withdrawal, storage, and distribution of water resources while minimizing impacts to Delta aquatic habitat and sensitive species.

5.3.3 Los Vaqueros Reservoir Expansion Project

The project would provide several opportunities for management to be flexible and implement adaptive management strategies to improve water supply reliability. As described above, two of the primary factors that would constrain water managers' ability to maintain existing levels of water supply as a result of climate change are limited pumping and storage capacity. The project would help to alleviate both of these constraints.

Under Alternatives 1 and 2, the new Delta Intake and Pump Station would provide 170 cfs of additional screened diversion capacity from the Delta, and the existing Old River Intake and Pump Station and Alternative Intake Project on Victoria Canal (AIP) would be operated at a combined rate of 500 cfs (up from current operations of 320 cfs combined). Total pumping capacity under Alternatives 1 and 2 would be 670 cfs, an increase of 350 cfs over the capacity of current operations. Under Alternative 3, the pumping capacity of the Old River Intake and Pump Station would be expanded by 70 cfs, which, in combination with the AIP, would become 570 cfs (an increase of 250 cfs over the current 320 cfs combined capacity).

This supplemental diversion capacity would be useful during the increased winter runoff scenarios that are projected under the effects of climate change. The additional 175 TAF of storage capacity in Los Vaqueros Reservoir under Alternatives 1 through 3 would allow needed flexibility between the timing of diversion and the timing of use. The South Bay Aqueduct (SBA) Connection included in Alternatives 1 and 2 would also permit direct conveyance of water from the Los Vaqueros Reservoir or the associated Delta intakes to the SBA via Bethany Reservoir and the South Bay Pumping Plant. Alternative 4 would provide an additional 60 TAF of storage capacity.

The extra intake and storage capacity provided by Alternatives 1 through 3 would substantially increase the flexibility of water diversion and delivery operations that will be needed to sustain water supply reliability under the projected effects of climate change. Alternative 4 would increase flexibility to a lesser extent. The project would help mitigate the effects of climate change and would facilitate the use of water to benefit fish and other aspects of the environment. **Table 5-2** compares the additional water management flexibility, in terms of pumping and storage capacity, that would result from each of the project alternatives.

TABLE 5-2
SUMMARY OF ADDITIONAL WATER MANAGEMENT FLEXIBILITY TO MITIGATE CLIMATE CHANGE

Alternative	Increase in maximum diversion capacity (cfs)	Increase in reservoir storage capacity (TAF)	Environmental Water Flexibility	Water Supply Flexibility	SBA Connection
Alternative 1	350	175	yes	yes	yes
Alternative 2	350	175	yes	yes	yes
Alternative 3	250	175	yes	yes	no
Alternative 4	0	60	yes	yes	no

Operations of the Delta were also examined under future climate change conditions with and without an expanded Los Vaqueros Reservoir. As expected, the response to climate change is mixed, depending on the assumptions and models used. Generally, available water supplies would decrease in drier years and would be mixed in wetter years, reflecting wetter conditions but earlier runoff. Generally, water quality conditions would degrade somewhat, especially in drier years, but water quality standards would still be met.

Operations of an expanded Los Vaqueros Reservoir respond in the following ways to climate change scenarios:

- The reservoir storage would tend to be lower in drier periods because of degraded water quality and reduced water availability. This indicates that stored water would be used more frequently in drier periods. Modeling also indicates that a modest increase of about 150 cfs in intake capacity over the amount planned for the proposed project would more than offset this effect of reduced storage levels. Such additional intake capacity could be considered in the future if climate change leads to the drier scenarios.

- The reservoir would tend to be at higher levels in wetter scenarios because of improved water quality and increased winter flows.

None of the climate change scenarios examined indicate that conclusions about the expansion project's impacts should be altered. Similarly, conclusions of the latest DWR studies (DWR, 2008) show only very modest changes in SWP operations under climate change scenarios.

CHAPTER 6
Summary of Impacts

6.1 Overview of the Environmental Effects of the Alternatives

For the Los Vaqueros Expansion project, four action alternatives and one No Project/No Action alternative were evaluated. Each of these alternatives is fully described in Chapter 3, Project Description. **Table 6-1** provides a summary of the major project components, for use in comparing the environmental effects of the alternatives.

TABLE 6-1
RESERVOIR EXPANSION ALTERNATIVES
WITH KEY DISTINGUISHING CHARACTERISTICS

Project Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Storage Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water/Benefits & Water Supply Reliability	Environmental Water/Benefits	Environmental Water/Benefits	Water Supply Reliability
New South Bay Connection?	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170 cfs intake facility on Old River	Construct new 170 cfs intake facility on Old River	Expand existing CCWD intake facilities by 70 cfs	No changes to existing intake facilities
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 670 cfs	Expand pipeline capacity from 320 cfs to 570 cfs	No changes to pipeline capacity

Table 6-2 provides a summary comparison of the chief environmental effects of the four project alternatives and the No Project/No-Action Alternative. In the table, Alternative 1 is compared to the No Project / No Action alternative, while Alternatives 2, 3 and 4 are compared with Alternative 1.

TABLE 6-2
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.2: Delta Hydrology and Water Quality					
Water supply delivery	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water supply. Water supply reliability for CCWD and other Bay Area water agencies would not be improved and additional emergency storage for CCWD and other Bay Area water agencies would not be increased. No additional supplies for improved environmental water management would be provided, and no additional water would be diverted through positive-barrier fish screens.	No significant adverse changes in Delta inflow, Delta outflow, upstream flows, CVP or SWP deliveries, or CVP and SWP reservoir carry-over storage that would cause impacts to the water supply of other users under existing and future conditions. Small changes in total Delta diversions, largely in periods with surplus flows, resulting in a more reliable water supply for the South Bay agencies, and no changes in SWP and CVP water supply deliveries. It would not affect water supplies of other water users. Average Delta outflow changes would be less than significant in both magnitude and timing, decreasing by less than half of 1 percent difference from the Existing and Future Without Project conditions.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Delta water quality	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water quality	Alternative 1 operations would not result in adverse changes in water quality causing the violation of a water quality standard or result in changes to Delta water quality that would result in significant adverse effects on beneficial uses.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Delta water levels	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have a direct or indirect effect on water levels for other Delta water users.	Largest decrease in Delta water levels estimated at lower-low tide during irrigation season would be -0.11 foot, which is less than 1.5 inches, and would occur infrequently (occurred once during irrigation season in modeled 16-year study period).	Same as Alternative 1	Largest decrease in water level estimated at lower-low tide during irrigation season would be 0.23 foot, which is less than 3 inches, and water level decreases greater than 0.1 foot would occur less than 1% of the time during irrigation season.	The largest decrease in water level changes estimated at lower-low tide during irrigation season would be 0.05 foot, and the estimated decrease in water level would not exceed 0.1 foot during irrigation season.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.2: Delta Hydrology and Water Quality (cont.)					
Cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels.	No new facilities would be constructed, no existing facilities would be modified. No change in operations of the Los Vaqueros Reservoir system or the CVP or SWP in a way that would have cumulatively considerable effects on water supply, Delta water quality or Delta water levels in the context of combined past, present, and probable future projects.	Alternative 1 operations would not result in a cumulatively considerable contribution to significant adverse cumulative effects on deliveries of water to other users, changes in Delta water quality, or change in Delta water levels.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.3: Delta Fisheries and Aquatic Resources					
In-channel construction - effects on fish/aquatic resources.	No new facilities would be constructed, no existing facilities would be modified. No impact.	In-channel construction activities associated with the new Delta Intake structure would increase short-term localized suspended sediment, turbidity, and possibly contaminant concentrations within Old River, which would increase exposure of various life stages and species of fish to temporarily degraded water quality conditions.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Underwater sound-pressure - effects on fish/aquatic resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Underwater sound-pressure levels generated during cofferdam installation for the new Delta Intake could result in behavioral avoidance or migration delays for special-status fish species.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Dewatering of cofferdam - effects on fish	No new facilities would be constructed, no existing facilities would be modified. No impact.	Dewatering of the cofferdam for the new Delta Intake could result in localized, short-term stranding of fish.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.3: Delta Fisheries and Aquatic Resources (cont.)					
Loss of aquatic habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction of new Delta Intake and Pump Station along Old River would result in loss of .2 acre (approximately 50 linear feet by 180 feet depth) of riprapped levee shoreline and install up to 0.79 acres of riprap.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Hydraulic conditions - changes due to new Delta intake structure and effects on fish	No new facilities would be constructed, no existing facilities would be modified. No impact.	Incremental changes in localized hydraulics and aquatic habitat characteristics at the new Delta Intake structure, including disorientation of fish and predator attraction, would be minor.	Same as Alternative 1	Construction of a new Delta Intake on Old River not included. No Impact.	Construction of a new Delta Intake on Old River not included. No Impact.
Delta fish populations and aquatic habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Water diversion operations would not result in significant adverse changes in Delta hydrologic conditions that affect Delta fish populations or quality and quantity of aquatic habitat within the Sacramento-San Joaquin River system, including the Delta.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Operation of screened Delta intakes - increased entrainment	No new facilities would be constructed, no existing facilities would be modified. No impact.	Fishery benefit largely due to shift of a portion of South Bay water agencies' Delta diversions to the expanded Los Vaqueros system, which provides improved fish screening relative to the SWP and CVP export facilities.	Same as Alternative 1	Significant increase in entrainment losses compared to without project conditions using the entrainment index method, which is based on the fish monitoring data near Delta water intakes. This substantial effect is caused by the operating rules evaluated for these facilities.	Alternative 4 generally provides no change or slight reductions in estimated potential entrainment.
Cumulative effects on Delta fisheries and aquatic resources	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Alternative 1 when combined with other planned projects or projects under construction in the area, could cumulatively contribute to substantial adverse impacts to Delta fisheries and aquatic resources.	Same as Alternative 1	Cumulative entrainment impacts of Alternative 3 would be significant and unavoidable	Alternative 4 would not contribute to cumulative adverse impacts on Delta fisheries.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.4: Geology, Soils and Seismicity					
Seismic hazards - ground shaking, liquefaction, and local slope stability	No new facilities would be constructed, no existing facilities would be modified. No impact.	All proposed facilities would be designed and engineered in accordance with seismic code requirements; therefore project would not expose people or structures to increased risk of loss, injury, or death involving strong seismic ground shaking or seismic-related ground failure, including liquefaction and landslides.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Soil erosion and loss of topsoil	No new facilities would be constructed, no existing facilities would be modified. No impact.	During construction the proposed project could result in substantial soil erosion or the loss of topsoil.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Unstable soils including expansive soils	No new facilities would be constructed, no existing facilities would be modified. No impact.	Unstable soils exist at the proposed new Delta Intake and Pump Station site; a pier foundation would be installed to support this facility, avoiding risks posed by the soils. No other significant areas of soil instability have been identified but a site-specific geotechnical investigation would be conducted for all major facilities and recommendations implemented to minimize or eliminate soil stability constraints and risks.	Same as Alternative 1	Same as Alternative 1	Fewer facilities, particularly no new Delta Intake and Pump Station, would result in less impact than Alternative 1.
Cumulative effects related to geology, soils or seismicity	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction would not make a cumulatively considerable contribution to cumulative effects associated with erosion, topsoil loss or increased exposure to seismic or other geohazard risks.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.5: Local Hydrology, Drainage and Water Quality					
Water quality	No new facilities would be constructed, no existing facilities would be modified. No impact.	Potential for increased erosion and sedimentation to local waterways, release of fuels or other hazardous materials during construction, or dewatering of excavated areas that could result in substantial water quality degradation.	Same as Alternative 1	Similar types of impact but less extent of impact than Alternative 1 due to construction of fewer facilities.	Similar types of impact but much less extent of impact than Alternative 1 due to construction of the fewest facilities of all the alternatives.
Local groundwater supplies and groundwater recharge	No new facilities would be constructed, no existing facilities would be modified. No impact.	Dewatering of construction area would result in localized and temporary changes in groundwater levels near the active dewatering sites but would not deplete local groundwater supplies. Facility sites would interfere with groundwater recharge to an insignificant extent.	Same as Alternative 1	Same as Alternative 1	Similar types of impact but much less extent of impact than Alternative 1 due to construction of the fewest facilities of all the alternatives.
Drainage patterns	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not substantially alter drainage patterns but reservoir expansion would increase the reservoir shoreline area subject to erosion.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Runoff water	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems but would increase potential stormwater pollution run off. Project would not provide substantial additional sources of polluted runoff during operation.	Same as Alternative 1	Similar type of impact but less extent of impact than Alternative 1 due to construction of fewer facilities.	Similar type of impact but less extent of impact than Alternative 1 due to construction of fewer facilities.
Flood hazard	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could place structures within a 100-year flood hazard area as mapped on a federal Flood Insurance Rate Map but project facilities would not appreciably impede or redirect flood flows.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would not place structures within a 100-year flood hazard area.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.5: Local Hydrology, Drainage and Water Quality (cont.)					
Risk of inundation from dam or levee failure	No new facilities would be constructed, no existing facilities would be modified. No impact.	Reservoir expansion and construction of new Delta Intake and Pump Station along Old River would not increase the risk inundation by dam or levee failure.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative effects related to drainage, flooding, groundwater recharge or water quality degradation in the project area	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction and operation of Alternative 1 would not make a cumulatively considerable contribution to cumulative effects on drainage, flooding, groundwater recharge or water quality degradation in the project area.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.6: Biological Resources					
NCCP habitat types / CDFG sensitive plant communities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would affect the following NCCP habitat types (CDFG sensitive plant communities in parentheses): Natural Seasonal Wetland (i.e., bulrush-cattail series, northern claypan vernal pool, bush seepweed, and saltgrass series), Valley/Foothill Riparian (i.e., Fremont cottonwood series and valley oak series), Grassland (i.e., purple needlegrass series) and Valley/Foothill Woodland Forest (i.e., blue oak series).	Same as Alternative 1	Same as Alternative 1	Would result in permanent losses to the same sensitive plant communities as Alternative 1 (except for no effects to Northern claypan vernal pool habitat) but to a reduced extent.
Jurisdictional wetlands, waters of the U.S. or the State, and streambeds and banks	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could permanently affect up to 6.3 acres jurisdictional wetlands, waters of the U.S. or the State, or streambeds and banks and temporarily affect 26.79 acres. Total impact is 32.96 acres.	Same as Alternative 1	Same as Alternative 1 except 5.98 acres affected permanently and 3.76 temporarily. Total impact is 9.74 acres.	Same as Alternative 1 except 3.65 acres affected permanently and 0.04 temporarily. Total impact is 3.69 acres.
Special-status plant species	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could affect populations of special-status plant species including brittlescale, San Joaquin spearscale, Brewer's dwarf-flax, and rose-mallow.	Same as Alternative 1	Construction could affect Brewer's dwarf-flax.	No impact.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.6: Biological Resources (cont.)					
California red-legged frog and California tiger salamander habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in impacts on California red-legged frog and California tiger salamander, including aquatic breeding habitat (11 ponds permanently and 5 temporarily) and upland aestivation habitat (1,126 acres permanently and 233 acres temporarily) for these species.	Same as Alternative 1	Slightly less than Alternative 1, affecting150.9 acres less of upland breeding habitat.	Less than Alternative 1, affecting 7 ponds permanently and 5 temporarily of aquatic breeding habitat and,523 acres of upland aestivation habitat for these species.
Western pond turtle populations	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in direct and indirect impacts on existing populations of and habitat for western pond turtle.	Same as Alternative 1	Same as Alternative 1, but to a lesser extent because Transfer-Bethany Pipeline would not be constructed.	Same as Alternative 1, though to a lesser extent because of smaller reservoir and fewer facilities.
Vernal pool species and habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in direct and indirect impacts on 16 ponds containing listed vernal pool branchiopods and their habitat, and on the non-listed midvalley fairy shrimp and curved-foot hygrotus diving beetle.	Same as Alternative 1	Less than Alternative 1 because Transfer-Bethany Pipeline would not be constructed, therefore only 1vernal pool would be affected.	Unlike Alternative 1, there would be no impact upon vernal pool species or habitat because Alternative 4 facilities would not be located near vernal pools.
San Joaquin kit fox habitat and regional movement	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would have temporary and permanent impacts on potential San Joaquin kit fox habitat (approximately 1,500 acres) and permanently reduce potential regional movement opportunities on western side of reservoir.	Same as Alternative 1	Direct kit fox habitat impacts under Alternative 3 would be somewhat less than under Alternative 1 due to the exclusion of the Transfer-Bethany Pipeline.	Direct kit fox habitat impacts under Alternative 4 would be less than under Alternative 1 (819 acres) due to the exclusion of pipeline construction and the smaller reservoir; however Alternative 4 would, like Alternative 1, permanently reduce potential regional movement opportunities on western side of Los Vaqueros Reservoir.
Burrowing owl habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would result in temporary and permanent loss of habitat for burrowing owl, affecting 233 acres temporarily and 1,126 acres permanently.	Same as Alternative 1	Same as Alternative 1, but affecting 150.9 fewer acres temporarily.	Less than under Alternative 1 due to the exclusion of pipeline construction and smaller reservoir; affecting 19.2 acres temporarily and 522.8 acres permanently.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.6 Biological Resources (cont.)					
Golden eagle, bald eagle, and Swainson's hawk species and habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and operation activities would result in direct and indirect impacts on existing populations of and habitat for golden eagle, bald eagle, and Swainson's hawk.	Same as Alternative 1	Same as Alternative 1, but 150.9 fewer acres affected because of exclusion of Transfer-Bethany Pipeline.	Same as Alternative 1, though to a lesser extent because no facilities constructed outside watershed.
			B (bald eagle)	B (bald eagle)	B (bald eagle)
Alameda whipsnake habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and increased reservoir water levels would result in temporary and permanent loss of potential and occupied habitat for Alameda whipsnake. 6.9 acres permanently impacted and 0.5 acres temporarily impacted.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1, except that 6.4 acres permanently impacted and 0.4 acres temporarily impacted,
Valley elderberry longhorn beetle species and habitat	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could result in direct and indirect impacts on valley elderberry longhorn beetle and its habitat, affecting 45 elderberry shrubs.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1, though lesser inundation area would affect 29 fewer elderberry shrubs.
Breeding bird nest sites and migratory birds	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect active breeding bird nest sites and new powerlines could affect migratory birds	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect designated critical habitat for listed species (vernal pool fairy shrimp and Contra Costa goldfields). 145.4 acres of vernal pool fairy shrimp habitat could be affected, and 98.1 acres of Contra Costa goldfields habitat.	Same as Alternative 1	Unlike Alternative 1, Alternative 3 would have no impact to designated critical habitat for vernal pool species because it does not include the Transfer-Bethany Pipeline.	Unlike Alternative 1, Alternative 4 would have no impact to designated critical habitat for vernal pool species because it does not include the Transfer-Bethany Pipeline.
Local and regional conservation plans and ordinances protecting biological resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project would not result in inconsistency with local and regional conservation plans, or local plans or ordinances protecting biological resources.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.6: Biological Resources (cont.)					
Special-status reptile species (San Joaquin coachwhip and coast horned lizard)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect nonlisted special-status reptile species (San Joaquin coachwhip and coast horned lizard). 943.6 acres to be affected permanently and 252.6 acres affected temporarily.	Same as Alternative 1	Same as Alternative 1, though 150.9 less acres temporarily affected because it does not include Transfer-Bethany Pipeline.	Same as Alternative 1, except 348.3 acres affected permanently and no temporary impacts because no facilities outside watershed to be constructed.
Special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities could affect nonlisted special-status mammal species (American badger, special-status bats, and San Joaquin pocket mouse). 943.6 acres to be affected permanently and 252.6 acres affected temporarily.	Same as Alternative 1	Same as Alternative 1, though 150.9 less acres temporarily affected because it does not include Transfer-Bethany Pipeline.	Same as Alternative 1, except 348.3 acres affected permanently and no temporary impacts because no facilities outside watershed to be constructed.
Pacific Flyway species (waterfowl and shorebirds)	No new facilities would be constructed, no existing facilities would be modified. No impact.	Draining the reservoir during project construction could affect Pacific Flyway species, including waterfowl and shorebirds.	Same as Alternative 1	Same as Alternative 1	Unlike Alternative 1, the reservoir would not be fully drained during construction; Alternative 4 impacts to Pacific Flyway species would be less than Alternative 1 effects.
Cumulative effects on special-status species and habitats	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Project construction would not make a cumulatively considerable contribution to cumulative effects on special-status species and habitats.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.7: Land Use					
Divide existing communities of Byron or Discovery Bay	No new facilities would be constructed, no existing facilities would be modified. No impact.	Facilities would not divide established communities.	Same as Alternative 1	Same as Alternative 1	No construction within any established community.
Conflict with any applicable land use plans	No new facilities would be constructed, no existing facilities would be modified. No impact.	Facilities would be located within the CCWD Watershed, on or adjacent to existing water system facility sites or in rural/agricultural areas. Facility siting in these locations would not conflict with applicable land use plans.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.7: Land Use (cont.)					
Conflict with aviation safety policies	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities within designated Airport Land Use Compatibility Zones near the Byron Airport could conflict with aviation safety policies such as height restrictions or nighttime lighting.	Same as Alternative 1	Same as Alternative 1	No construction within Airport Land Use Compatibility Zones near Byron Airport.
Create flight hazards at local airport	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities within the Airport Influence Area for Byron Airport could cause potential temporary flight hazards through: the creation of glare or distracting lights; the generation of dust or smoke, which could impair pilot visibility; or could attract an increased number of birds.	Same as Alternative 1	Same as Alternative 1	No construction within designated Airport Land Use Compatibility Zones near Byron Airport, but other construction could attract avian wildlife and create flight-related hazards.
Cumulative effects related to conflicts with land use plans and policies or dividing an existing community	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	No conflicts with any applicable land use plan or policy adopted for the purpose of reducing or avoiding environmental impacts.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.8: Agriculture					
Temporary affect Important Farmland	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could temporarily affect about 171 acres of Important Farmlands. This would represent less than 0.4 percent of the 41,619 acres of Important Farmlands in Contra Costa County. No Important Farmlands are within the project area in Alameda County.	Same as Alternative 1	Alternative 3 would temporarily affect up to 149 acres of Important Farmland, compared to 171 acres for Alternative 1. This represents about 0.3 percent of Important Farmlands in Contra Costa County.	Unlike Alternative 1, Alternative 4 would not temporarily affect any Important Farmlands.
Permanently convert Important Farmland	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction of a new Delta Intake and Pump Station would result in permanent conversion of about 22 acres of Important Farmland and could result in additional long-term loss of Important Farmland if protective measures are not taken during construction.	Same as Alternative 1	Unlike Alternative 1, no permanent conversion of Important Farmland would result from Alternative 3 since there would be no construction of a new Delta Intake and Pump Station; however, Alternative 3 could result in long-term loss of Important Farmland if protective measures are not taken during construction.	Unlike Alternative 1, Alternative 4 would not result in permanent conversion any Important Farmlands since there would be no construction of a new Delta Intake and Pump Station.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.8: Agriculture (cont.)					
The project would not conflict with zoning for agricultural use or a Williamson Act contract.	No new facilities would be constructed, and no changes in CCWD facilities or operations would conflict with zoning for agricultural use or a Williamson Act contract.	Under Alternative 1, up to nine properties with Williamson Act contracts would be temporarily affected by construction of pipelines because these facilities would require acquisition of temporary construction easements, and in the case of the Transfer-Bethany Pipeline, a temporary construction plus a permanent utility easement.	Same as Alternative 1	Under Alternative 3, up to four properties under Williamson Act contracts would be affected by construction of the Delta-Transfer Pipeline, the Transfer-LV Pipeline, and Power Option 1, which is less contracted land would be affected than under Alternative 1.	Unlike Alternative 1, under Alternative 4 there would be no land under Williamson Act Contracts affected by the project.
Cumulative temporary effects upon agricultural land and long-term conversion of Important Farmlands to non-agricultural uses	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	The incremental contribution of farmland conversion associated with Alternative 1 would be a cumulatively considerable contribution to an existing significant cumulative impact.	Same as Alternative 1	Unlike Alternative 1, no incremental contribution of farmland conversion would result from Alternative 3; however, Alternative 3 could result in long-term effects upon Important Farmland if protective measures not taken during construction.	Alternative 4 would not contribute to cumulative adverse impacts related to agriculture.
Section 4.9: Transportation and Circulation					
Traffic congestion during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project construction activities would intermittently and temporarily increase traffic congestion due to vehicle trips generated by construction workers and construction vehicles on area roadways.	Same as Alternative 1	Similar to but less than Alternative 1	Much less than Alternative 1
Access and emergency services disruption and creation of traffic safety hazards during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project construction activities would intermittently and temporarily impede access to local streets or adjacent uses, including access for emergency vehicles and could substantially increase traffic hazards due to construction in or adjacent to roads or possible road wear.	Same as Alternative 1	Similar to Alternative 1	No impact.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.9 :Transportation and Circulation (cont.)					
Traffic safety hazards during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project construction activities would intermittently and temporarily increase potential traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways due to increased traffic volumes.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative transportation and circulation effects	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Project construction, when combined with construction of other future projects, could contribute to construction-related short-term cumulative impacts to traffic and transportation (traffic congestion, access disruption, and traffic safety).	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.10: Air Quality					
Criteria air pollutant emissions / Federal general conformity	No facilities would be constructed and no impacts associated with criteria air pollutants would result.	Construction would generate short-term emissions of criteria air pollutants: ROG, NOx, CO, and PM10 that could potentially contribute to existing nonattainment conditions and further degrade air quality. However, this alternative would not exceed federal general conformity *de minimis* standards for emissions.	Same as Alternative 1	Same as Alternative 1, though emissions would be less intense because Transfer-Bethany Pipeline and new Delta Intake and Pump Station would not be constructed.	Same as Alternative 1, though emissions would be less intense because no facilities outside watershed would be constructed.
Violation of applicable air quality standards	No facilities would be constructed and no violation of applicable air quality standards would result.	Operation would not result in emissions of criteria air pollutants at levels that would substantially contribute to a potential violation of applicable air quality standards or to nonattainment conditions.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Expose sensitive receptors to substantial pollutant concentrations	No facilities would be constructed and no impacts associated with substantial pollutant concentrations would result.	Construction and/or operation would not expose sensitive receptors to substantial pollutant concentrations.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.10: Air Quality (cont.)					
Objectionable odors	No facilities would be constructed and no impacts associated with objectionable odors would result.	Operation would not create objectionable odors affecting a substantial number of people.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative greenhouse gas emissions	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and operation would not make a cumulatively considerable contribution to greenhouse gas emissions. CCWD would continue to implement actions to reduce GHG emissions of its overall water system enterprise.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative air quality effects	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction could result in cumulatively considerable increases of criteria pollutant emissions. Operation would not make a cumulatively considerable contribution to regional air quality impacts.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.11: Noise					
Exceed local noise standards during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Facilities construction would generate noise levels that exceed noise thresholds at nearby sensitive receptors if construction activities are carried out during noise-sensitive hours.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Exceed local noise standards during operation	No new facilities would be constructed, no existing facilities would be modified. No impact.	Project operations would generate traffic, stationary source, and area source noise similar to existing noise associated with operation of Los Vaqueros Reservoir system and would not exceed County noise requirements.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Ground-borne vibration or noise.	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not expose persons to or generate excessive ground-borne vibration or ground-borne noise levels.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.11: Noise (cont.)					
Cumulative effects of construction and operation noise and vibration	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative noise or vibration impacts.	No cumulatively considerable contribution to operational noise levels or ground-borne vibration. Potential for cumulative noise impacts if construction overlaps with other projects in the vicinity (i.e., Cecchini Ranch, Brentwood Solid Waste Transfer Facility Expansion and/or various road safety improvements).	Same as Alternative 1	Same as Alternative 1	No cumulative noise effects.
Section 4.12: Utilities and Public Service Systems					
Disrupt utility services / public health hazard	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could temporarily disrupt utility services during construction such that a public health hazard could be created or an extended service disruption could result.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Require or result in new or expanded utility infrastructure or public service facilities that result in substantial adverse physical impacts	No new facilities would be required, no existing facilities would be modified. No impact.	Alternative 1 would not require or result in construction of new or expanded utility infrastructure or public service facilities that would result in substantial adverse physical impacts.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Solid waste generation / exceed the capacity of local landfills.	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities would generate solid waste for disposal but this would not exceed the capacity of local landfills.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Cumulative effects upon public services and utilities, or local landfill capacity	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative utility or public service impacts.	Construction could result in cumulatively considerable contributions to cumulative effects on public services and utilities, and local landfill capacity.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.13: Hazardous Materials / Public Health					
Health risks during construction	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction not create significant health risks due to exposure to subsurface soils and groundwater during construction.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Accidental release of hazardous materials during construction or operation	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction or operation could, through routine transport, use or disposal, accidentally release hazardous materials thereby exposing construction workers, project personnel and the public to hazardous materials or accidentally releasing hazardous materials into the soil, groundwater, and/or a nearby surface water body.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Wildland fires	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could result in improper handling or use of flammable or combustible materials such as internal combustion equipment could result in wildland fires, exposing people or structures to a significant risk of loss, injury, or death.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Electric and magnetic fields (EMF)	No new facilities would be constructed; no effects on public health or safety related to EMF.	Construction project power supply facilities would not locate electrical transmission facilities within 150 feet of a school and there would be no EMF effects.	Same as Alternative 1, impacts under Alternative 2 would be Less than Significant	Same as Alternative 1, impacts under Alternative 3 would be Less than Significant	Unlike Alternative 1, there would be no effects under Alternative 4
Cumulative effects associated with hazardous materials, public health, accidental hazardous material spills, wildland fires or EMF	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction or operation would not cause cumulatively considerable contributions to any significant cumulative effect related to hazardous materials or public health, accidental hazardous material spills, wildland fires or exposure to EMF.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.14: Visual/Aesthetic Resources					
Negative aesthetic effect on a scenic vista.	No new facilities would be constructed, no existing facilities would be modified. No impact.	Would not have a substantial, demonstrable negative aesthetic effect on a scenic vista.	Same as Alternative 1	Under Alternative 3, construction activities and facility siting impacts would be less than Alternative 1.	Alternative 4 impacts would be less than Alternative 1 due to a smaller reservoir expansion (160 TAF only) and fewer project components.
Degrade the existing visual character or quality	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction activities and facility siting would result in a weak visual contrast and would not dominate nor obstruct the views of the public or recreational users; therefore, Alternative 1 would not substantially degrade the existing visual character or quality of the site and its surroundings.	Same as Alternative 1	Under Alternative 3, construction activities and facility siting impacts would be less than Alternative 1.	Unlike Alternative 1, Alternative 4 impacts associated with the 160 TAF Borrow Area would substantially degrade the existing visual character and quality of the site and its surroundings
New source of light or glare	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction and operations would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users. However, a conductor within an area where no transmission lines currently exist could result in a noticeable visual change during the daytime. Therefore, operation of Power Option 1 could result in a new source of substantial glare that would be visible to the public from SR 4.	Same as Alternative 1	Construction and operational impacts would be less than Alternative 1, though Alternative 3 includes the conductor and therefore could result in a new source of substantial glare.	Unlike Alternative 1, Alternative 4 would not result in creation of a new source of substantial light or glare that would be visible to the public or recreational users
Cumulative effects upon scenic vistas, visual character or quality, or new sources of light or glare	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	No cumulatively considerable contribution to adverse effects on visual/aesthetic resources in the project area or broader region.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.15: Recreation					
Loss of recreation areas	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would require closure of Los Vaqueros Watershed to the public during the 3-year construction period and additional 2-year restriction for water-related activities causing short-term loss of recreation areas and activities provided in the watershed (fishing boating, hiking, picnicking, interpretive center). Following construction, CCWD Watershed would reopen to the public with similar but expanded recreational facilities and use areas. There would be no long-term adverse effects on recreation; there would be long-term benefits.	Same as Alternative 1	Same as Alternative 1	Alternative 4 construction would be of shorter duration (2 years) with no additional time restriction for water-related activities. Alternative 4 requires less recreation facility replacement and relocation. Similar to Alternative 1, it would have short term effects and long-term benefits.
Increased use of existing parks or recreational facilities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	Same as Alternative 1	Same as Alternative 1	Alternative 4 construction would be of shorter duration (2 years) and similar to Alternative 1 would not increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
Cumulative effects on recreation facilities, opportunities or experiences	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	No cumulatively considerable contribution that would reduce recreational opportunities, increase the use of existing neighborhood and regional parks, or otherwise contribute to a cumulative effect on recreation facilities, opportunities or experiences.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.16: Cultural and Paleontological Resources					
Disturbance of historical or archaeological resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Potential to impact 41 known historical resources, the Reburial site, and the Kellogg Creek Historic District due to construction and/or operation. There are additional areas of moderate to high potential for undiscovered cultural resources as well as human remains within the APE.	Same as Alternative 1	Alternative 3 would result in similar but less impact than Alternative 1 because the Transfer-Bethany Pipeline would not be constructed; potential effect on 39 historic resources rather than 41. Impacts to the Kellogg Creek Historic District and historic resources within the district would remain the same as Alternative 1	Alternative 4 would result in less impact than Alternative 1, affecting 15 historic properties (26 fewer than Alternative 1), as well as the Reburial site and Kellogg Creek District. Potential effects to previously unidentified cultural resources would be reduced compared to Alternative 1 because fewer facilities would be constructed.
Paleontological resources	No new facilities would be constructed, no existing facilities would be modified. No impact.	Earth disturbing activities could intersect and destroy fossil resources within certain sedimentary formations since the depth to bedrock associated with the majority of the APE would be less than 6 feet.	Same as Alternative 1	Although Alternative 3 components involve less area with depth to bedrock of less than 6 feet when compared to Alternative 1, earth disturbing activities and associated impacts to paleontological resources would be less but similar to Alternative 1.	Although Alternative 4 components involve much less area with depth to bedrock of less than 6 feet when compared to Alternative 1, earth disturbing activities and associated impacts to paleontological resources would be less but similar to Alternative 1.
Disturbance of human remains	No new facilities would be constructed, no existing facilities would be modified. No impact.	Impact to five known burial sites as well as the Reburial site. Ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains.	Same as Alternative 1	Alternative 3 would result in the similar effects as Alternative 1 on known human remains and the Reburial site because the impacts are caused by construction of facilities common to both alternatives. Alternative 3 also proposes ground disturbing activities in some areas with moderate to high potential for previously unrecorded human remains. Although there are no known burial sites within the APE for the Old River Intake and Pump Station Expansion and no potential impacts on known sites with human remains are expected, overall effects to	Alternative 4 would not affect the Reburial site and would have fewer impacts to known human remains when compared to Alternative 1. While the extent of impacts would be less, the nature of the impacts on known and previously unrecorded human remains would be equivalent to those from Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.16: Cultural and Paleontological Resources (cont.)					
Disturbance of human remains (cont.)				known and previously unrecorded human remains under Alternative 3 would be similar to Alternative 1.	
Cumulative effects associated with disturbance of historical, archaeological or paleontological resources or disturbance of human remains	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction of the project and proposed Vasco Wind Energy Repowering Project could contribute to cumulative cultural resource impacts. Construction of these and additional area projects would result in a significant cumulative impact to paleontological resources. Construction would not result in cumulative impacts associated with disturbance of human remains.	Same as Alternative 1	Cumulative impacts to paleontological resources would be less but similar to Alternative 1. Cumulative effects to cultural resources would be the same as Alternative 1.	Cumulative impacts to paleontological resources would be less but similar to Alternative 1. Cumulative effects to cultural resources would be similar to but less than Alternative 1.
Section 4.17: Socioeconomic Effects					
Local income and employment	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction could temporarily generate new income and local employment affecting Contra Costa County's economy and resulting in beneficial impacts to the local economy.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Agricultural effects upon local economy	No new facilities would be constructed, no existing facilities would be modified. No impact.	Construction effects upon Contra Costa County and Alameda County's agricultural economy would be very minor.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Recreation income effects upon local economy	No new facilities would be constructed, no existing facilities would be modified. No impact.	Short-term loss of recreation income associated with project construction effects upon Contra Costa County's economy would be very minor.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1, though less impact due to shorter duration of construction.
Cumulative effects upon local income and employment	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction, when combined with construction of other future projects, could beneficially effect on income and local employment.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.17: Socioeconomic Effects (cont.)					
Cumulative effects upon local agricultural economy	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	The incremental contribution of farmland conversion would be a cumulatively considerable contribution to an existing cumulative impact and would therefore be unavoidable.	Same as Alternative 1	Cumulative effects would not be cumulatively considerable because no important farmland would be converted.	Cumulative effects would not be cumulatively considerable because no important farmland would be converted.
Cumulative effects of recreation income upon local economy	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Cumulative economic impacts from project-related construction and relocation of the recreation facilities would be minor.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.18: Environmental Justice					
Disproportionately affect identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Relatively little construction would occur near the Byron CDP and none in Census Tract 3031.00, therefore construction impacts to areas with minority or low-income populations would not cause a disproportionate impact to the minority and low-income community in the area.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would not implement any project activities within 2 miles of Census Tract 3031.00 or the Byron CDP, and could not cause a disproportionate impact to the minority and low-income communities in the area.
Disproportionately affect local employment opportunities for identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No impact.	Employment opportunities including apprentice positions could result in minor beneficial effects that would be equally available to all populations.	Same as Alternative 1	Alternative 3 would involve less construction, reducing opportunities for local employment; however, these jobs would be equally available to communities of concern.	Alternative 4 would involve much less construction, reducing opportunities for local employment; however, these jobs would be equally available to communities of concern.
Cumulative effects upon identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction effects would not disproportionately affect nearby minority and/or low-income communities.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would not implement any project activities within 2 miles of Census Tract 3031.00 or the Byron CDP, and could not cause a cumulative disproportionate impact to the minority and low-income communities in the area.

TABLE 6-2 (Continued)
ALTERNATIVES IMPACT COMPARISON SUMMARY

Resource / Impact Issue	No Project / No Action	Alternative 1 (as compared to the No Action Alternative)	Alternative 2 (as compared to Alternative 1)	Alternative 3 (as compared to Alternative 1)	Alternative 4 (as compared to Alternative 1)
Section 4.18: Environmental Justice (cont.)					
Cumulative effects upon local employment opportunities for identified minority and/or low income communities	No new facilities would be constructed, no existing facilities would be modified. No contribution to cumulative impacts.	Construction and operation would not disproportionately affect local employment opportunities for minority and/or low-income communities in the vicinity of the project.	Same as Alternative 1	Same as Alternative 1	Alternative 4 would involve much less construction, reducing cumulative opportunities for local employment; however, jobs would be equally available to communities of concern.
Section 4.19: Indian Trust Assets					
Indian Trust Asset land affected	No Trust land affected.	The project would not affect Indian Trust Assets.	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1
Section 4.20: Growth-Inducing Effects					
Growth Inducement	It is expected that the South Bay water agencies would pursue supplemental water supplies to support planned growth within their service areas in accordance with their long-term water supply and management plans and Urban Water Management Plans (updated in five-year increments). CCWD would continue to serve planned growth in its services area in accordance with its Future Water Supply Plan and as planned to secure dry-year supplies to maintain supply reliability.	This alternative would improve water supply reliability of the South Bay water agencies and CCWD. It would restore some of the Delta supply the South Bay water agencies have previously planned to receive. This alternative would not support growth beyond that already planned for by the South Bay water agencies and CCWD. However, this alternative would improve water supply reliability for South Bay water agencies and CCWD compared with existing and future without project conditions.	No growth-inducing potential for South Bay water agencies; improved water supply reliability for CCWD	No growth inducing potential for South Bay water agencies; improved water supply reliability for CCWD	No growth-inducing potential for South Bay water agencies; improved water supply reliability for CCWD

CHAPTER 7

Environmental Review and Agency Consultation/Coordination

Since the initial phases of project development beginning in 2001, CCWD and Reclamation have engaged and consulted with agencies, stakeholders, landowners, and the general public. These consultations assisted the lead agencies in determining the scope of the EIS/EIR, identifying the range of alternatives and mitigation measures, and defining potential environmental impacts and impact significance. Consultation included informal agency communications, formal interagency meetings, and public meetings. CCWD and Reclamation will continue to solicit public and agency input on the project by encouraging review of this Draft EIS/EIR. As noted previously, CCWD is the lead agency pursuant to CEQA and Reclamation is the lead agency pursuant to NEPA.

This chapter summarizes public and agency involvement activities undertaken by CCWD and Reclamation that have been conducted to date for this project, and which satisfy NEPA and CEQA requirements for public scoping and agency consultation and coordination. Appendix F, EIS/EIR Distribution List presents the entities receiving a copy of the Draft EIS/EIR.

7.1 Stakeholder Consultation

The Los Vaqueros Reservoir Expansion Project communication strategy involves informing the public about the project, as well as engaging agencies and stakeholders to partner and collaborate together to move the project forward for public and agency review. An extensive public and stakeholder involvement process was implemented, which included a Customer and Stakeholder Feedback Group, an Agency Coordination Work Group (ACWG), public workshops, stakeholder and agency meetings, newsletters and a project website. Between 2001 and the public scoping process in early 2006, the lead agencies conducted more than 170 meetings with regional water task forces, city and county governments and local water agencies (approximately 100), elected officials (approximately 15), media (approximately 10), other Delta-related projects, environmental and stakeholder groups, homeowners associations in the project area, and potentially affected landowners (approximately 45).

Outreach activities have included continuous coordination with and input from public agencies including the Department of Water Resources (DWR), U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (DFG), National Marine Fish Service (NMFS), and local water agencies through regularly held ACWG meetings and additional briefings. CCWD has presented at various CALFED-related public meetings including environmental justice workshops and tribal forums. Meetings have been held with agency staff working as part of multi-agency CALFED workgroups, as well as staff working only for their respective agencies on non-CALFED-related activities. CCWD regularly participates in the CALFED Bay-Delta Public Advisory Committee, Water Supply Subcommittee together with representatives from Reclamation, DWR, CALFED Bay-Delta Authority, statewide water agencies, and stakeholders.

7.2 Notice of Preparation and Notice of Intent

Reclamation and CCWD notified interested parties of the scoping period and upcoming public scoping meetings through electronic and postal service mailings and through publication of a Notice of Intent (NOI) and Notice of Preparation (NOP) consistent with NEPA and CEQA, respectively.

Reclamation published a NOI in the Federal Register on December 20, 2005 to advise interested agencies and the public that an EIS would be prepared. On January 10, 2006, CCWD published and distributed a NOP to advise interested agencies and the public that an EIR would be prepared. CCWD distributed the NOP to approximately 80 agencies, elected officials, and interested parties.

7.3 Public Scoping

Public scoping activities are conducted as part of compliance with both NEPA and CEQA, but are more formalized under NEPA. Scoping is intended to assist in identifying the final range of actions, alternatives, site design options, environmental resources, and mitigation measures that will be analyzed in an environmental document. The scoping process helps ensure that problems are identified early and properly studied and also helps to eliminate from detailed study those issues that are not critical to the decision at hand.

The approximately 70-day scoping comment period extended from December 20, 2005 through February 28, 2006. The public was invited to submit written comments on the scope, content, and format of the environmental document by mail, fax, or email to representatives at CCWD and Reclamation.

7.3.1 Scoping Meetings

During the Public Scoping Process, Reclamation and CCWD conducted four formal scoping meetings to gather input and comments prior to the development of the EIS/EIR. The tabulation below shows the dates and locations of the four meetings. Approximately 55 people attended the four meetings.

Sacramento, CA
Tuesday, January 24, 2006
1:30 to 3:30 p.m.
Department of Water Resources
Bonderson Building
(Public Hearing Room – 1st Floor)
901 P Street
Sacramento, CA 95814

Antioch, CA
Tuesday, January, 24, 2006
6:00 to 8:00 p.m.
Veteran's Memorial Building, Legion Hall
403 West 6th Street
Antioch, CA 94509

Livermore, CA	**Concord, CA**
Wednesday, January 25, 2006	Thursday, January 26, 2006
6:00 to 8:00 p.m.	6:00 to 8:00 p.m.
Martinelli Event Center	Contra Costa Water District
Agricultural Center	1331 Concord Avenue
3583 Greenville Road	Concord, CA 94520
Livermore, CA 94550	

The format of each public meeting program was identical and began with a 45-minute open house during which participants could view exhibit boards with project information including an overview of the regional context, project objectives and purposes, possible alternatives, environmental issues, the environmental review process, and the project schedule. Participants were also encouraged to ask informal questions of project team members to understand the project objectives and alternatives.

Participants were encouraged to sign in and were provided with materials including an agenda, open house program, presentation slides, comment card, and speaker card. Copies of the NOI and NOP were available upon request.

A formal 15-minute presentation focused on the process, schedule, and role of public comments. Following the presentation, 60 minutes were allotted for public comments on the scope, content, and format of the environmental document. Comments were accepted in writing; a court reporter recorded oral comments. The informational materials, presentation slides, and exhibit boards used during the scoping meetings as well as the written and oral scoping comments, attendance sheets and meeting summaries are included in the project Scoping Report, described below.

7.3.2 Scoping Report

A Scoping Report was prepared and is included in Appendix A, Notices and Public Involvement of this Draft EIS/EIR. The report outlines the process and outcome of the scoping meetings and other activities.

Specifically, this report includes an overview of scoping requirements; a list of all documents / products generated for project outreach; a summary of all comments made during the scoping process, both written and verbal; a description of the issues anticipated to be addressed in the EIS/EIR; and an appendix that includes hard copies of all written comments, summaries of the scoping meetings, and other project-related print materials used to inform interested parties about the project alternatives and the EIS/EIR.

7.3.3 Public Information Materials

In addition to the NOP, NOI, and Scoping Report, numerous informational materials were publicly distributed to inform stakeholders about the Los Vaqueros Reservoir Expansion Project and to solicit their input. These materials are described below.

Press Release

Interested parties were notified about the public scoping meetings through a press release. The press release provided basic information; date, time, and location of meetings; and a brief explanation of the public scoping process and encouraged recipients to attend the open house/public scoping meetings. Reclamation distributed the press release on January 5, 2006.

CCWD Newspaper Notices

CCWD published a display advertisement in the Central Zone and East Zone editions of the *Contra Costa Times*, the primary newspaper in CCWD's service area, on Wednesday, January 18, 2006, and Sunday, January 22, 2006. In addition, a legal advertisement was published Thursday, January 19, 2006. The advertisements announced CCWD and Reclamation's intention to prepare an EIS/EIR, the places and times of the scoping meetings, CCWD contact information, and the availability of information on CCWD's project web site.

Reclamation News Release

Reclamation issued a news release on January 27, 2005, announcing the scoping meetings and soliciting public input on the project. The distribution list included 48 recipients, including newspapers; radio stations; television stations; water districts; and interested agencies, groups, and organizations.

Web Sites

An electronic copy of the meeting display advertisement was posted on the CCWD project web site, www.lvstudies.com, and the Reclamation project web site, www.usbr.gov/mp/vaqueros.

General Notification Flyer

Reclamation prepared and CCWD mailed a notification flyer to approximately 2,000 interested organizations, agencies, elected officials, and residents on January 12, 2006.

7.4 Additional Steps in the Environmental Review Process

In accordance with CEQA and NEPA requirements, this Draft EIS/EIR will be circulated for public and agency review and comment for a 60-day period following the publishing of the Notice of Availability (NOA) of the EIS by the U.S. Environmental Protection Agency (EPA), and filing of the Notice of Completion (NOC) with the California State Clearinghouse.

Similar to the approach to public scoping, public hearings have been scheduled throughout the greater project area to receive public input on the Draft EIS/EIR. Public hearings, to be located in Concord, Dublin, Livermore, Oakley, and Sacramento, will be held during the public comment period so that any comments received at the meetings can be addressed in the Final EIS/EIR. In addition, written comments from the public, reviewing agencies and stakeholders will be accepted during the public comment period. Following consideration of these comments by CCWD and Reclamation, a Final EIS/EIR will be prepared and circulated per NEPA and CEQA requirements that will include responses to all comments. CCWD and Reclamation will use the Final EIS/EIR when considering approval of one of the project alternatives. Once a project is approved, CCWD will adopt CEQA findings and issue a Notice of Determination (NOD) and Reclamation will issue a Record of Decision (ROD) to document that decision.

7.5 Ongoing Agency and Stakeholder Consultation and Coordination

CCWD and Reclamation will continue to proactively engage interested agencies and stakeholders throughout the NEPA, CEQA, and project permitting processes. In particular, CCWD and Reclamation will continue to have regular meetings with NMFS, USFWS, and DFG. CCWD will continue regular interactions with local, state and federal agencies through the ACWG. CCWD will also meet as needed with other agencies with potential permitting authority over the approved project including U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board, State Water Resources Control Board, Reclamation Districts 2040 and 800, California State Office of Historic Preservation, Bay Area Air Quality Management District, and others.

7.6 Compliance with Federal Statutes and Regulations

The following sections describe relevant federal laws, executive orders, and policies, and the status of compliance. **Table 7-1** summarizes the status of consultation for the requirements that must be met by Reclamation and CCWD before the Los Vaqueros Reservoir Expansion project can be built and operation of facilities implemented.

Compliance with most of these regulations is an ongoing process being conducted in coordination with preparation of this EIS/EIR. The information and analysis in relevant sections of this Draft EIS/EIR will be used in the regulatory compliance process. For example, Section 4.6 Biological Resources identifies loss of wetlands under Section 404 of the Clean Water Act as an issue for the reservoir expansion project, assesses the potential for impacts and recommends mitigation measures to address those impacts. This analysis will be used to apply for a USACE permit under Section 404 of the Clean Water Act. During and after construction, relevant permit conditions will be adhered to as a requirement for project implementation.

7.6.1 Federal Endangered Species Act

Pursuant to the Federal Endangered Species Act (FESA), USFWS and NMFS have authority over projects that may result in take of a federally listed species. Under FESA, the definition of “take” is to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” USFWS has also interpreted the definition of “harm” to include significant habitat modification that could result in take. If there is a likelihood that a project would result in take of a federally listed species, either an incidental take permit, under Section 10(a) of FESA, or a federal interagency consultation, under Section 7 of FESA, is required.

TABLE 7-1
SUMMARY OF ENVIRONMENTAL COMPLIANCE FOR THE PROPOSED PROJECT

Requirements	Status of Compliance/Expected Completion
National Environmental Policy Act	Ongoing until this EIS/EIR Record of Decision published.
California Environmental Quality Act	Ongoing until this EIS/EIR document certified and mitigation met.
Federal Endangered Species Act and California Endangered Species Act	Ongoing until project Biological Opinion issued (see Sec. 4.6 Biological Resources).
Magnuson-Stevens Fishery Conservation and Management Act	Ongoing until project Biological Opinion issued (see Sec. 4.3 Delta Fisheries and Aquatic Resources).
Fish and Wildlife Coordination Act	Ongoing until Fish and Wildlife Coordination Act Report issued (see Sections 4.3 Delta Fisheries and Aquatic Resources and 4.6 Biological Resources).
Clean Water Act Section 401	CCWD will apply for Water Quality Certification after EIS/EIR is approved and project design underway (see Sec. 4.5 Local Hydrology, Drainage, and Groundwater).
Clean Water Act Section 404	CCWD will apply for Wetland Permit after the EIS/EIR is approved and project design underway (see Sec. 4.6 Biological Resources).
Clean Air Act	In compliance. Conformity analysis is not required. (see Sec. 4.10 Air Quality).
National Historic Preservation Act and Native American Consultation	Ongoing. Once Section 106 review process is completed, the project will proceed in accordance with conditions stipulated in the agreement with the State Historic Preservation Officer and appropriate agencies (see Section 4.16 Cultural and Paleontological Resources).
Executive Order 11988 - Floodplain Management	Ongoing. The project complies by using this EIS/EIR to identify and assess project effects (see Section 4.5 Local Hydrology, Drainage, and Groundwater).
Executive Order 11990 - Protection of Wetlands	CCWD will apply for Wetland Permit after the EIS/EIR is approved and project design underway (see Sec. 4.6 Biological Resources).
Executive Order 12898 - Environmental Justice	In compliance based on EIS/EIR Sec. 4.18 Environmental Justice.
Migratory Bird Treaty Act	Reclamation and CCWD will comply with provisions of the Migratory Bird Treaty Act (see Sec.4.6 Biological Resources).
California Fish and Game Code (Section 1600 Lake or Streambed Alteration Agreement Program)	Ongoing. The project complies with Section 1600 by using this EIS/EIR to identify and address expected project effects (Sec.4.6 Biological Resources).
Caltrans Encroachment Permit	As needed, CCWD will apply for a Caltrans Encroachment Permit to construct within Caltrans right-of-way prior to construction (see Sec. 4.9 Transportation and Circulation).
Disabilities Regulations - Americans with Disabilities Act, Rehabilitation Act, and Architectural Barriers Act	Project will adhere to the construction guidelines of the Uniform Federal Accessibility Standards and comply with regulations proposed for incorporation into the Americans With Disabilities Act Accessibility Guidelines as a part of design for individual facilities.
Farmland Protection Policy Act	Ongoing. (see 4.8 Agriculture).
Section 10 of the Rivers and Harbors Act of 1899	Ongoing. This regulation is addressed in coordination with wetlands regulations (see Clean Water Act, Section 404, above).
NPDES Construction Stormwater Permit	CCWD will comply by preparing and using a Storm Water Pollution Prevention Plan at the time of construction (see Sec. 4.5 Local Hydrology).
General Order for Dewatering and Other Low Threat Discharge to Surface Waters	CCWD will comply by preparing and using a permit at the time of construction (see Sec. 4.5 Local Hydrology, Drainage and Groundwater).

Either an Action Specific Implementation Plan (ASIP) or a Biological Assessment (BA) could be used to address both FESA and the California Endangered Species Act (CESA) as well as the California Natural Community Conservation Planning Act (NCCPA) consultation requirements of federal and state agencies. The ASIP or BA will be prepared for the selected project alternative. Reclamation will initiate formal consultation with USFWS and NMFS. USFWS and NMFS will then use the ASIP or BA to develop biological opinions for the selected project alternative. DFG will use the ASIP or BA to address compliance with CESA and NCCPA.

7.6.2 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) ensures that fish and wildlife receive equal consideration during planning and construction of federal water projects. The FWCA requires that USFWS's views be considered when evaluating impacts and determining mitigation needs. USFWS is preparing the FWCA Report and has conducted Habitat Evaluation Procedures analyses for most of the proposed project facility sites to date. USFWS continues to participate in ACWG meetings reviewing preparation of the Draft EIS/EIR impact analysis. USFWS also participates in additional work group meetings focused on the analyses and documentation conducted in compliance with related environmental regulations including the ASIP process for compliance with FESA and CESA.

7.6.3 Clean Water Act

The Clean Water Act (CWA) is the primary surface water protection legislation throughout the country. The CWA aims to restore and maintain the chemical, physical, and biological integrity of surface waters to support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water." The U.S. Environmental Protection Agency (EPA) is the federal agency with primary authority for implementing regulations adopted pursuant to the CWA, and has delegated the authority to implement and oversee most of the programs authorized or adopted for CWA compliance to USACE and the Regional Water Quality Control Boards (RWQCB).

Under Section 404(b)(1) of the CWA, the Least Environmentally Damaging Practicable Alternative (LEDPA) must be identified from among those alternatives considered in detail in the EIS/EIR. If a federal agency is a partner in the implementation of a project, then the Proposed Action/Project must be recognized as the LEDPA. A 404(b)(1) evaluation will be included with the Final EIS/EIR pursuant to the CWA to provide required information on the potential effects of the proposed action/project regarding water quality and rationale in support of identifying the LEDPA. This Draft EIS/EIR will be reviewed by concerned public and stakeholders with the opportunity to provide comments on the alternatives and documentation before making determinations of the Proposed Action/Project, LEDPA, environmentally preferred alternative, and environmentally superior alternative in the Final EIS/EIR.

Construction of the proposed project, including construction of the proposed intake facilities, pipelines, expanded reservoir, appurtenant facilities, and other associated facilities, would be subject to regulation under Sections 401, 402, and/or 404 of the Clean Water Act. CCWD and Reclamation have participated in a pre-application meeting with USACE, and CCWD will prepare and submit an application for Section 404 compliance in the near future. CCWD will also be seeking a Section 401 water quality certification from the Central Valley RWQCB.

7.6.4 Section 10 of the Rivers and Harbors Act of 1899

Under Section 10 of the Rivers and Harbors Act of 1899, the construction of structures in, over, or under, excavation of material from, or deposition of material into "navigable waters" are regulated by USACE. Navigable waters of the United States are defined as those waters subject to the ebb and flow of the tide shoreward to the mean high-water mark or those that are currently used, have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. A Letter of Permission or permit from the USACE is required prior to any work being completed within navigable waters.

CCWD will obtain the necessary permits from USACE prior to beginning any project-related work in navigable waters.

7.6.5 Section 106 of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended in 1992) requires federal agencies to evaluate the effects of federal undertakings on historical, archaeological, and cultural resources, and to consult with the Advisory Council on Historic Preservation concerning potential effects of federal actions on historic properties. Before federal funds are approved for a particular project or prior to the issuance of any license, the effect of the project on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register shall be evaluated. The effects of the proposed Los Vaqueros Reservoir Expansion Project on historical, archeological, and cultural resources are evaluated in Section 4.16 Cultural and Paleontological Resources.

To comply with the NHPA, notices of public meetings for this project will be sent to the State Historic Preservation Officer (SHPO), which acts as an intermediary for the Advisory Council on Historic Preservation. A copy of this Draft EIS/EIR will be sent to SHPO, as a unit of the California Department of Parks and Recreation, requesting its review and soliciting input on the project. CCWD and Reclamation will coordinate with the Advisory Council on Historic Preservation and SHPO, consistent with Section 106 of the NHPA.

7.6.6 Indian Trust Assets and Native American Consultation

Indian Trust Assets

An Indian Trust Asset (ITA) is defined by Reclamation as a legal interest in an asset that is held in trust by the U.S. Government for Indian tribes or individual tribal members. Examples include. land assets held in trust for individual tribal members, more specifically referred to as allotments, or as in the case of allotments created out of public domain lands - Public Domain Allotments (PDAs). An Indian trust has three components: 1) the trustee, 2) the beneficiary, and 3) the trust asset. ITAs can include water rights, lands, minerals, hunting and fishing rights, money, and claims.

Beneficiaries of the Indian trust relationship are federally recognized Indian tribes and individual tribal members with trust land; the United States is the trustee.

By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. The definition and application of the U.S. trust relationship has been defined by case law that supports Congressional acts, executive orders, and historical treaty provisions. The project alternatives would not be implemented on or affect tribal lands, areas where mineral or water rights may be held by a tribe, traditional hunting or fishing grounds, or other ITAs. The potential for the project to affect significant Native American sites is addressed in Section 4.19 Indian Trust Assets.

Native American Consultation

Implementing regulations for Section 106 require that federal agencies identify potentially affected Indian tribes that might have knowledge of sites of religious and cultural significance in the area of potential effects (APE) (36 CFR 800.3[f][2]). If any such properties exist, the regulations require that federal agencies invite Indian tribes to participate in the Section 106 process as consulting parties. Consultation with the Native American Heritage Commission is ongoing.

7.6.7 Farmland Protection Policy Act

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact of federal programs with respect to the conversion of farmland to nonagricultural uses. It ensures that, to the extent possible, federal programs are administered to be compatible with state, local, and private programs and policies to protect farmland. The Natural Resources Conservation Service (NRCS) is the agency primarily responsible for implementing the FPPA. Agricultural resources are addressed in Section 4.8 “Agriculture”. CCWD and Reclamation will submit this Draft EIS/EIR to the NRCS for its comment.

7.6.8 Executive Order 11988 (Floodplain Management)

Executive Order 11988—Floodplain Management (May 24, 1977) directs federal agencies to issue or amend existing regulations and procedures to ensure that the potential effects of any action it may take in a floodplain are evaluated and that its planning programs and budget requests reflect consideration of flood hazards and floodplain management. Guidance for implementation of the Order is provided in the floodplain management guidelines of the U.S. Water Resources Council (40 CFR 6030; February 10, 1978) and in *A Unified National Program for Floodplain Management*, prepared by the Federal Interagency Floodplain Management Taskforce.

CCWD and Reclamation have considered Executive Order 11988 in their development of this Draft EIS/EIR and have complied with this order.

7.6.9 Executive Order 11990 (Protection of Wetlands)

The purpose of Executive Order 11990 is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, the Order requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The Order applies to:

- acquisition, management, and disposition of federal lands and facilities construction and improvement projects which are undertaken, financed or assisted by federal agencies; and
- federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

CCWD and Reclamation have considered Executive Order 11990 in their development of this Draft EIS/EIR and have complied with this order. CCWD has taken a number of actions to minimize project effects on wetlands (see Section 4.6 Biological Resources) and will be pursuing a CWA Section 404 permit from the USACE.

7.6.10 Executive Order 12898 (Environmental Justice)

Executive Order 12898, Section 2-2, requires all federal agencies to conduct programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color or national origin. Section 1-101 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of programs on minority and low-income populations. This Draft EIS/EIR has identified and described the project's potential to result in disproportionately high and adverse human health or environmental effects on minority and low-income populations (see Section 4.18 Environmental Justice), as required by this order.

CHAPTER 8

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CHAPTER 9

List of EIS/EIR Preparers

This EIS/EIR was prepared by CCWD and Reclamation. A list of persons who prepared various sections of the EIS/EIR, significant background materials, or participated to a significant degree in preparing the EIS/EIR is presented below and in **Table 9-1**.

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TABLE 9-1
LIST OF PREPARERS

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TABLE 9-1 (Continued)
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CHAPTER 10
Glossary

100-year flood	The flood having a one percent chance of being equaled or exceeded in magnitude in any given year. Contrary to popular belief, it is not a flood occurring once every 100 years.
acre-foot (AF)	The volume of water that would cover 1 acre to a depth of 1 foot. Equal to 1,233.5 cubic meters (43,560 cubic feet).
Action Specific Implementation Plan (ASIP)	Document that may serve as a biological assessment for compliance with Section 7 of the Federal Endangered Species Act and the natural community conservation plan for compliance with the California Endangered Species Act and the California Natural Community Conservation Planning Act.
Alternative Intake Project (AIP)	The new CCWD intake, currently under construction and expected to be operational in 2010, that is located along Victoria Canal and connected to the Old River Pipeline. The maximum capacity of the intake will be 250 cubic feet per second.
anadromous fish	Fish that spend a part of their lifecycle in the sea and return to freshwater streams to spawn.
appropriation	The right to withdraw water from its source.
Bay Area	San Francisco Bay Area
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin estuary.
beneficial uses	Those uses of water as defined in the State of California Water Code (Chapter 10, Part 2, Division 2), including but not limited to, agricultural, domestic, municipal, industrial, power generation, fish and wildlife, recreation, and mining.
bentonite	A clay mineral used in drilling operations; mixed with water to form a gel that lubricates the drill bit, helps keep the walls of a borehole intact, and helps bring drill cuttings to the surface.
Biological Opinion	Document issued under the authority of the Federal Endangered Species Act stating the findings of the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service as to whether a federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction of adverse modification of critical habitat.
borrow area	An excavated area or pit created by the removal of earth material to be used as fill in a different location.
bromate	A chemical compound of bromine that can be formed from the ozonation of water containing bromide. A disinfection byproduct of ozone water treatment.
bromide	A chemical compound of bromine with another element or radical naturally occurring in small concentrations in sea water. Bromides interact with disinfection agents used in water treatment to create disinfection byproducts that have potential adverse health effects.

CALFED Bay-Delta Program (CALFED)	Joint federal and state program to address water-related issues in the Sacramento-San Joaquin Delta.
California Environmental Quality Act (CEQA)	Act requiring California public agency decision-makers to document and consider the environmental impacts of their actions. Also requires an agency to identify ways to avoid or reduce environmental damage and to implement those measures where feasible. Provides means to encourage public participation in the decision-making process.
CalSim II	Agreed upon CVP-SWP implementation of the CalSim model code.
CalSim model	A planning model designed to simulate the operations of the CVP and SWP reservoir and water delivery system under current and future conditions; predicts how reservoir storage and river flows would be affected based on changes in system operations; output is typically used to help assess impacts on water supply, water quality, aquatic resources, and recreation.
Central Valley Project (CVP)	Multiple-purpose federal water project operated by the Bureau of Reclamation in California extending from the Cascades to the Tehachapi Mountains. Consists of 20 dams and reservoirs, 11 powerplants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities. Manages some 9 million acre-feet of water.
channel	Natural or artificial watercourse, with a defined bed and banks to confine and conduct continuously or periodically flowing water.
CNEL	Community Noise Equivalent Level adds a 5-dBA "penalty" for the evening between 7:00 p.m. and 10:00 p.m. in addition to a 10-dBA penalty between 10:00 p.m. and 7:00 a.m. See also "decibel (dB)", below.
conjunctive use	A water management strategy for the coordinated use of groundwater and surface water resources.
consumptive uses	The application of water to agricultural, municipal, or industrial uses. In contrast, non-consumptive uses would include water dedicated to fish and wildlife.
Contra Costa Canal	The 48-mile canal that begins at Rock Slough and travels west to Clyde, south to Walnut Creek, and north to Martinez.
cooperating agency	Any federal agency other than the lead agency that has jurisdiction by law or special expertise with respect to the environmental impacts expected to result from a proposed project.
criteria air pollutants	Pollutants that are the primary focus of regulatory agencies as indicators of ambient air quality, which include ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead. These are the most prevalent air pollutants known to be harmful to human health, and extensive documentation on health-effects criteria is available for them.
critical habitat	An area designated as critical habitat listed in 50 CFR Parts 17 or 226 (50 CFR Section 402.02); specific geographic areas, whether occupied by special-status species or not, that are determined to be essential for the conservation and management of the special-status species, and that have been formally described in the Federal Register.
cryptosporidium	A waterborne intestinal parasite of the genus Cryptosporidium that can cause the disease cryptosporidiosis in humans and other vertebrates. The disease, characterized by vomiting, diarrhea, abdominal cramps, and fever, can be severe or fatal to immuno-suppressed individuals.
cubic foot per second (cfs)	A measurement of water flow equivalent to one cubic foot of water passing a given point in a second.

cultural resource	An aspect of a cultural system that is valued by or significantly representative of a culture or that contains significant information about a culture. Properties such as landscapes or districts, sites, buildings, structures, objects, or cultural practices that are usually more than 50 years old and possess architectural, historic, scientific, or other technical value.
cumulative impact	For NEPA purposes, defined in Council of Environmental Quality (CEQ) regulations as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Under CEQA, defined as the change in the environment that results from the incremental impact of the project when added to other, closely related past, present, and reasonably foreseeable probable future projects.
CVP Improvement Act (CVPIA)	This federal legislation, signed into law on October 30, 1992, mandates major changes in the management of the Federal CVP; puts fish and wildlife on an equal footing with agricultural, municipal, industrial, and hydropower uses.
CVP Operations Criteria and Plan (OCAP)	Document that identifies the factors influencing the physical and institutional conditions and decision-making process under which the CVP operates.
CVP Tracy Pumping Plant	The CVP pumping plant in the south Delta.
CVP water	As defined by Section 3403(f) of the CVPIA, all water developed, diverted, stored, or delivered in accordance with statutes authorizing the CVP, in accordance with terms and conditions of water rights acquired pursuant to California law; water diverted by CCWD under its CVP contract.
decibel (dB)	A unitless measure of sound on a logarithmic scale that indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals. An A-weighted dB (dBA) is an overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear. A measurement that includes the low frequency component is denoted by dBL.
delivered water	General term for water provided to CCWD untreated- and treated-water customers.
Delta	In this report, “Delta” refers to the delta formed by the Sacramento and San Joaquin Rivers. See also “Sacramento-San Joaquin Delta”, below.
Delta balanced conditions	During balanced conditions, Delta inflow and exports are controlled by Reclamation and DWR to meet SWRCB environmental and water quality standards, the needs of in-Delta diverters, and CVP/SWP exports from the Delta. Balanced conditions in the Delta can occur at any time of the year, but generally occur during late spring, summer, and fall, or during very dry years.
Delta excess conditions	During excess (also known as surplus) conditions, Delta flow requirements for water quality and environmental regulations have been met, and excess water is available for Delta users.
Delta inflow	The combined water flow entering the Delta at a given time from the Sacramento River, San Joaquin River, and other Central Valley tributaries.
Delta outflow	The net amount of water (not including tidal flows) at a given time flowing out of the Delta towards the San Francisco Bay. The Delta outflow equals Delta inflow minus the water used within the Delta and exported from the Delta.
delta smelt	A small, slender-bodied fish with a typical adult size of 2 to 3 inches that is found only in the Sacramento-San Joaquin Delta estuary.

Delta surplus	Under excess conditions in the Delta, surplus water is available to Delta users after all environmental protection and water quality regulations have been met.
desalination	A process whereby the salt concentration of sea water or brackish water is reduced, generally through an advanced form of water treatment.
dewater	To remove water.
disinfection byproducts (DBPs)	Chemical, organic, and/or inorganic substances that can form during a reaction of a disinfectant (such as chlorine or ozone) with naturally occurring materials in water.
diversion	A location where water is removed from a water body (river, creek, reservoir, etc.) for use in another location.
DNL	The 24-hour day and night A-weighted noise exposure level, which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night ("penalizing" nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dBA to take into account the greater annoyance of nighttime noises.
DSM2	The Delta hydrodynamic and salinity model developed by DWR to simulate hydrodynamic and mixing processes in the Delta, using upstream river flows and salinities, downstream tidal stage and salinity, diversion rates, agricultural return flow and seepage rates, and salinities as boundary conditions.
ecosystem	A geographically identifiable area that encompasses unique physical and biological characteristics. An ecosystem is the sum of the plant community, animal community, and environment in a particular region or habitat.
electric and magnetic fields (EMF)	Fields of force caused by electric voltage and current around the electric wire or conductor when an electric transmission line or any electrical wiring is in operation. Magnetic fields exist only when current is flowing. Electric fields are present in electrical appliances and cords whenever they are plugged in.
electrical conductivity (EC)	A measure of salinity in water.
endangered species	Any species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all or a significant portion of its range. Official federal designations of endangered species are made by the USFWS or NMFS and published in the Federal Register. Species are listed under the California Endangered Species Act by the California Department of Fish and Game.
Endangered Species Act (ESA)	The federal or state acts administered by the USFWS/NMFS and California Department of Fish and Game, respectively, to list and protect animal and plant species that are listed as threatened or endangered, are formally recognized candidates for listing, or are declining to a point where they may be listed.
entrainment	The incidental trapping of fish and other aquatic organisms in water diverted from streams, rivers, and reservoirs. The process of drawing fish into diversions along with water, resulting in the loss of such fish.
Environmental Impact Report (EIR)	A detailed statement (i.e., report) prepared under the California Environmental Quality Act by a state or local agency describing and analyzing the significant environmental effects of a project and discussing ways to mitigate or avoid the effects.

Environmental Impact Statement (EIS)	An environmental impact document required of federal agencies under the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. Describes the positive and negative effects of the proposed action, lists alternative actions, and documents the information required to evaluate the environmental impacts of a proposed action.
environmental justice	Defined by the U.S. Environmental Protection Agency (EPA) Office of Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." Fair treatment means "no group of people, including racial, ethnic, or socioeconomic group shall bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."
erosion	The gradual wearing away of land by water, wind, and general weather conditions; the diminishing of property by the elements. With regard to levees specifically: loss of levee material as a result of the effects of channel flows, tidal action, boat wakes, and wind-generated waves.
evapotranspiration	Water losses from the surface of soils and plants.
expansive soils	Soils that shrink and swell as a result of moisture changes.
export	Water diversion from the Delta used for purposes outside the Delta.
export/inflow (E/I) ratio	This requirement of the SWRCB Water Rights Order D-1641 presently limits Delta exports by the state and federal water projects to a percentage of Delta inflow. In July through January, 65% of inflow can be exported. During February through June, months most critical to fisheries, the allowable E/I ratio is reduced to 35% to help diminish reverse flows and the resulting entrainment of fish caused by south Delta export operations.
federal P&Gs	Principles and Guidelines for federal water studies, published as "Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" by the U.S. Water Resources Council, 1983.
fish screen	Barrier on the front face of a river intake to prevent fish and debris from being drawn into the intake.
floodplain	Any land area susceptible to inundation by floodwaters from any source.
flow	The volume of water passing a given point per unit of time.
groundwater	Any water naturally stored underground in aquifers, or that flows though and saturates soil and rock, supplying springs and wells.
habitat	The specific area or environment in which a particular type of animal or plant lives.
impingement	Contact or collision with a diversion structure (used to describe deleterious effects of some diversion facilities on aquatic species).
Important Farmland	Farmland categories mapped by the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP). Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance are often described together under the term "Important Farmland."
integrated water resource planning	An open and participatory planning process emphasizing least-cost principles and a balanced consideration of objectives, infrastructure risk, supply, resources and demand management options for meeting water needs.
L50	The noise level that is equaled or exceeded 50 percent of the specified time period. The L50 represents the median sound level.

L90	The noise level that is equaled or exceeded 90 percent of the specified time period. The L90 is sometimes used to represent the background sound level.
Leq	The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).
levee	An embankment raised to restrict a river to a defined channel.
liquefaction	The process in which soil loses cohesion when subject to seismic activity (i.e., shaking).
Lmax	The instantaneous maximum noise level for a specified period of time.
Los Vaqueros Project	CCWD's 1998 project which included the construction of the Los Vaqueros Reservoir and associated facilities, such as the Old River intake and Old River, transfer, and Los Vaqueros pipelines. The primary purposes of the Los Vaqueros Project are to improve the quality of water supplied to CCWD customers, to minimize seasonal water quality changes in delivered water, and to improve the reliability of the emergency water supply available to CCWD.
minimum flow	Lowest flow in a specified period of time.
mitigation	One or more of the following: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing an impact by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action; and/or (5) compensating for an impact by replacing or providing substitute resources or environments.
modeling	Computer simulations of natural and man-made water systems used to provide a forecast of outcomes for a variety of parameters, such as water quality, flow rates, and reservoir levels, under an assumed set of conditions.
National Environmental Policy Act (NEPA)	Act that directs federal agencies to prepare an environmental impact statement for all major federal actions that may have a significant effect on the environment. States that it is the goal of the federal government to use all practicable means, consistent with other considerations of national policy, to protect and enhance the quality of the environment. Requires all federal agencies to consider the environmental impacts of their proposed actions during the planning and decision-making processes.
neap tide	Especially low high tides and high low tides that occur during quarter moons, when the gravitational forces of the moon and the sun are perpendicular to one another with respect to the Earth. The opposite of a spring tide.
Notice of Availability (NOA)	The notice issued by a local, state, or federal agency to publicly announce that a draft environmental impact report or environmental impact statement is available for review, pursuant to the California Environmental Quality Act and the National Environmental Policy Act, respectively.
Notice of Intent (NOI)	The notice issued by a federal agency to publicly announce its intention to prepare an environmental impact statement, pursuant to the National Environmental Policy Act.
Notice of Preparation (NOP)	The notice issued by a state or local agency to publicly announce its intention to prepare an environmental impact report, pursuant to the California Environmental Quality Act.
Old River intake	The CCWD intake located on Old River, with conveyance facilities linked to the Contra Costa Canal and Los Vaqueros Reservoir. The maximum capacity of the intake is 250 cubic feet per second.

opacity	The amount of light obscured by particle pollution in the atmosphere.
peak flow	Maximum instantaneous flow in a specified period of time.
Piezometer	A device used to measure ground-water pressure head at a point in the subsurface. It can consist of either an vertical open pipe that allows the depth to the water in pipe to be measured, or an electronic instrument (or less commonly pneumatic or hydraulic) embedded in the ground that records hydrostatic pressure.
Qwest	A broad indication of the net direction and quantity of flow in the San Joaquin River at Jersey Point. This is only an indicator since net flow is not measurable at this location. Considerable tidal exchange at this point is not included, because Qwest is an estimate of net flow conditions. A positive Qwest indicates the net flow is generally in the downstream direction towards San Francisco Bay. A negative number indicates that the net flow is generally in the upstream direction to the east. Generally, a positive Qwest is desirable for Delta flow circulation, water quality, and fisheries.
reclamation district	A district formed under California State Water Code 50000 *et. seq.* as a way to pay for the costs of reclaiming land for future use. Reclamation districts are formed in areas that have been inundated with water, such as swamps, salt marshes, or tidelands.
Record of Decision (ROD)	Concise, public, legal document that identifies and officially discloses the federal lead agency's decision following the completion of an environmental impact statement.
recycled water	Wastewater that becomes suitable for a specific beneficial use as a result of treatment.
reservoir	An artificially impounded body of water.
responsible agency	As per the CEQA Guidelines, a public agency other than the lead agency that has discretionary approval over a project.
riparian area	The land adjacent to a natural watercourse such as a river or stream. Riparian areas support vegetation that provides important wildlife habitat, as well as important fish habitat when sufficient to overhang the bank or fall into the water.
Rock Slough intake	The CCWD intake located near the town of Oakley and used to serve the Contra Costa Canal. Also referred to as Pumping Plant No. 1.
Sacramento splittail	A somewhat large (40-centimeter full-length) *Cyprinid* endemic to the Sacramento and San Joaquin River systems and other drainages of the San Francisco Bay.
Sacramento-San Joaquin Delta (Delta)	The legal Delta, as described in the California Water Code Section 12220, generally extends from Sacramento to the north, Tracy to the south, Interstate 5 to the east, and Collinsville to the west. The Delta covers approximately 738,000 acres.
salinity	The amount of dissolved salts in a given volume of water.
seawater intrusion	The intrusion and mixing of saline or brackish water into a body of freshwater (in this case, into the Delta).
sedimentation	The phenomenon of sediment or other fine particulates entering a water body, or being disturbed from the bottom of a water body such that they move downstream and settle on the substrate in other aquatic areas.
seiche	A wave on the surface of a lake or landlocked bay caused by atmospheric or seismic disturbances.
seismicity	The frequency, intensity, and distribution of earthquake activity in a given area.

siltation	Sediment influx either from erosion or sediment carried into a water body by inflowing rivers and tributaries.
soil corrosion	The deterioration of metal due to interaction with materials in the soil; corrosion generally occurs in soils with high moisture content, high electrical conductivity, high acidity, and high dissolved salts.
South Bay Aqueduct (SBA)	A State Water Project facility that conveys water from Bethany Reservoir to the South Bay water agencies in Alameda and Santa Clara Counties.
South Bay water agencies	The South Bay water agencies include the three water agencies served by the SBA (Alameda County Water District, Santa Clara Valley Water District, Alameda County Flood Control and Water Conservation District, Zone 7).
special-status species	Federal and state classifications for plant and animal species that are listed as threatened or endangered, are formally recognized candidates for listing, or are declining to a point where they may be listed.
spring tide	The tide with the most variation in water level, occurring during new moons and full moons. This is the time of the highest high tide and the lowest low tide. The opposite of a neap tide.
stage	Water surface elevation; the elevation above mean sea level (msl) datum (typically measured in feet msl).
State Water Project (SWP)	California's largest water supply project operated and maintained by the California Department of Water Resources that stores surplus water during wet periods and later distributes it to areas of need in the San Francisco Bay area, northern California, San Joaquin Valley, and southern California. SWP facilities include 23 dams and reservoirs, 18 pumping plants, 4 generating-pumping plants, 5 hydroelectric power plants, and approximately 600 miles of canals and pipelines.
stormwater	Untreated surface runoff into a body of water during periods of precipitation.
Stormwater Pollution Prevention Plan (SWPPP)	Required to be developed and implemented when an entity is obtaining a General Permit under the National Pollutant Discharge Elimination System (NPDES). The SWPPP has two major objectives: (1) to help identify the sources of sediment and other pollutants that affect the quality of stormwater discharges, and (2) to describe and ensure the implementation of best management practices to reduce or eliminate sediment and other pollutants in stormwater as well as non-stormwater discharges.
subsidence	A decrease in ground surface elevation in the Delta, which results primarily from peat soil being converted into gas.
SWP Harvey O. Banks Pumping Plant	The SWP export pumping plant in the south Delta. The plant is located downstream of Clifton Court Forebay.
take	Defined in the Federal Endangered Species Act as "…harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" on special-status species covered under the Act.
terrestrial species	Types of species of animals and plants that live on or grow from the land.
threatened species	Legal status afforded to plant or animals species that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, as determined by the U.S. Fish and Wildlife Service or NMFS for federal species and by the California Department of Fish and Game for state species.
tidal flow	Water movements caused by tidal forces (i.e. gravitational); used to describe the movement of water in Delta channels caused by tidal level variations propagating from San Francisco Bay.
total Delta inflow	See Delta inflow.

total organic carbon (TOC)	A measure of organic matter content in water, which plays a significant role in aquatic ecosystems and has direct implications to drinking water treatment, including the potential for formation of disinfection byproducts.
treated water	Water treated at a water treatment plant and delivered to municipal and industrial customers.
turbidity	A measure of the cloudiness of water caused by the presence of suspended matter. Turbidity in natural waters may be composed of organic and/or inorganic constituents, and has direct implications to drinking water treatment.
unregulated tributary	A tributary stream that does not have a reservoir or other feature used to restrain or control flows.
uplands	The area on the landward side of the tidal marsh, where the land surface is not inundated by even the highest tides.
water right	A legal entitlement, granted as a permit or license from the California State Water Resources Control Board, authorizing water to be diverted from a specified source and put to beneficial, nonwasteful use.
water use efficiency	Refers to actions or activities that lead to sustainable or renewable uses of water and includes water conservation, water recycling and desalination.
waters of the U.S.	As defined in the Clean Water Act Section 404, waters of the U.S. applies only to surface waters, rivers, lakes, estuaries, coastal waters, and wetlands. Not all surface waters are legally waters of the U.S. Generally, those waters include interstate waters and tributaries, intrastate waters and tributaries used in interstate and/or foreign commerce, territorial seas at the cyclical high-tide mark, and wetlands adjacent to the above.
watershed	A region or area that ultimately drains to a particular watercourse or body of water.
wetland	A zone that is periodically or continuously submerged or has high soil moisture, has aquatic and/or riparian vegetation components, and is maintained by water supplies significantly in excess of those otherwise available through local precipitation.
Williamson Act	The California Land Conservation Act of 1965, commonly known as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use for 10 years. In return, landowners receive property tax assessments that are based on farming and open space uses as opposed to full market value.
X2	An index used to assess the location of, and thus the movement of, salinity inland from the ocean to the Delta. Used by regulatory agencies to establish estuarine habitat objectives, it is defined as the distance in kilometers from the Golden Gate Bridge to the point at which 2 parts-per-thousand salinity is found at any given time.

APPENDIX A
Notices and Public Involvement

A-1. Scoping Report

A-2. CCWD CEQA Notice of Completion

A-3. Reclamation Notice of Availability

A-1 SCOPING REPORT

LOS VAQUEROS RESERVOIR EXPANSION PROJECT

Scoping Report

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

CONTRA COSTA WATER DISTRICT

April 2008

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1.0 Introduction

Contra Costa Water District (CCWD) proposes the expansion of its existing Los Vaqueros Reservoir to make additional storage available in a strategic location that could benefit local, state and federal interests for environmental protection and water supply reliability. The U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation) and the California Department of Water Resources (DWR) have joined with CCWD to evaluate various expansion alternatives. CCWD as the Lead Agency under the California Environmental Quality Act (CEQA) and Reclamation as the Lead Agency under the National Environmental Protection Act (NEPA) are preparing a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR). DWR is a Responsible Agency under CEQA and will rely on the EIS/EIR for any decisions it makes related to the proposed project. As part of the public involvement process for the EIS/EIR, the lead agencies asked for input on the scope of the environmental review for the project through a series of workshops and hearings and a written comment period. This report presents a summary of the issues raised during scoping and provides a blueprint for how these issues will be addressed in the EIS/EIR.

2.0 Proposed Action

The San Francisco Bay/Sacramento-San Joaquin Delta Estuary is the largest estuary on the West Coast and provides essential habitat for a diverse array of fish and wildlife. It is also the critical hub in the conveyance of drinking water supplies to over two-thirds of the California population and irrigation supplies to 7 million acres of agricultural lands. The chairman of the Governor's Delta Vision Blue Ribbon Task Force summarized the state of the Delta as follows:

> "The Delta is in crisis, and each day brings us closer to a major disaster, be it from flooding, from the decline of important fish species, or from court-ordered reductions in the amount of water that can be pumped for the state's water supply." (Resources Agency, 2007)

CCWD's existing Los Vaqueros Reservoir is an off-stream storage reservoir that is strategically located adjacent to the Delta and in close proximity to the major state and federal water system facilities exporting water from the Delta. CCWD currently pumps water from the Delta into this 100 thousand acre-foot (TAF) capacity reservoir through state-of-the-art fish screens. Having this storage capacity allows CCWD to adjust the timing of its Delta water diversions throughout the year to both maximize water quality and minimize impacts to fish. Expanding the Los Vaqueros Reservoir in this strategic location presents an opportunity to expand its benefits and immediately begin addressing some of the central issues fueling the Delta crisis. Reservoir expansion could reduce impacts to Delta fisheries resulting from current state and federal water system export practices, provide water to improve environmental conditions in the Delta and its associated tributary rivers and wetlands, and improve water supply reliability for Bay Area water users.

The proposed action includes expanding the reservoir from its current 100 TAF to as large as 275 TAF[1], expanding Delta diversion capacity, expanding conveyance to the Reservoir and adding, in some alternatives, conveyance to State Water Project facilities serving Bay Area communities.

Figure 1 presents the study area for the project. The primary study area includes the Los Vaqueros watershed and associated dam, reservoir, and support facilities, which are situated in eastern Contra Costa County, in the coastal foothills west of the Delta and east of San Francisco Bay; the central and south Delta; and the service areas of certain Bay Area water agencies that may be directly affected by the project. These agencies include CCWD as well as the three agencies that receive their State Water Project water via the South Bay Aqueduct (SBA): Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7 Water Agency); Alameda County Water District; and Santa Clara Valley Water District. Other agencies that may be affected include the San Francisco Public Utilities Commission or other Bay Area water agencies.

Project Objectives

The proposed project has two primary objectives and one secondary objective. The wording of the objectives has been refined since the scoping meetings in 2006, but the underlying objectives remain the same.

Primary Objectives:

1. Develop water supplies for environmental water management that supports fish protection, habitat management and other environmental water needs.

2. Increase water supply reliability for water providers within the San Francisco Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

1. Improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives state above.

[1] At the time of scoping for the project, the maximum size reservoir under consideration was 500 TAF. Based on preliminary feasibility and environmental studies, the maximum size under consideration is now 275 TAF.

SOURCE: USGS, 1993 (base map); and ESA, 2008

Figure 1
Project Study Area

In addition to these objectives, CCWD Board of Directors' Resolution No. 03-24, June 25, 2003, provides important guidance for identifying and evaluating plans involving the expansion of Los Vaqueros Reservoir. The Resolution is included as Appendix H.

Reservoir Expansion Alternatives

Delivery Objectives and Operations

A range of reservoir expansion alternatives has been developed for further detailed evaluation. The alternatives are summarized in Table 1. It should be noted that the maximum reservoir capacity being considered is 275 TAF. During scoping, a larger reservoir of 500 TAF was presented as a possible alternative. Based on preliminary feasibility and environmental analyses, this alternative has been eliminated from further study. Additionally, an alternative with a direct connection to the South Bay Aqueduct has also been eliminated based on preliminary feasibility and environmental analyses.

TABLE 1
ALTERNATIVES UNDER CONSIDERATION

Alternative	Primary Objective	LV Storage Capacity (TAF)	Delivery Connection	Maximum Delta Diversion Capacity (CFS)
No Action	NA	100	NA	320
1	Environmental water and Bay Area reliability	275	Pipeline to Bethany Reservoir	1000
2 [(a)]	Environmental water	275	Pipeline to Bethany Reservoir	1000
3	Environmental water and Bay Area reliability	275	Existing interties	670
4	Bay Area reliability	160	Existing interties	320

(a) Alternative 2 has the same facilities as Alternative 1 but would be operated differently to achieve different objectives.

The expanded reservoir would be operated in a manner similar to the current operation of Los Vaqueros Reservoir: when surplus high-quality water is available in the Delta, it would be diverted from the Delta for storage in the expanded reservoir. CCWD now uses Los Vaqueros Reservoir to capture high-quality flows from the Delta, typically available each year during and following the wet season, to blend with more saline Delta supplies that typically occur during the dry season. An expanded reservoir would allow more high-quality water to be diverted into storage when surplus water (in excess of all other needs) is available in the Delta and when fish impacts are low.

Currently, the reservoir operation is controlled by CCWD's water quality needs, and this would remain a key operational factor for the expanded reservoir. Like the current reservoir, an expanded reservoir would also be operated in accordance with other Delta operations, water-rights permits, the requirements of applicable biological opinions issued by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for Endangered Species Act compliance, and memoranda of understanding issued by the California Department of Fish and Game for species protection.

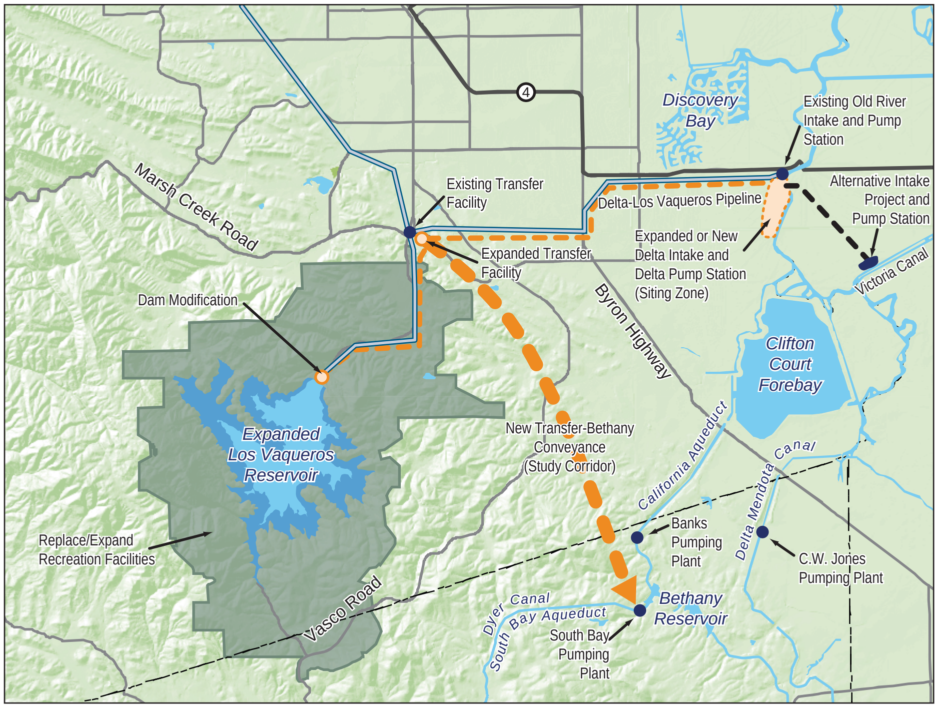
Required Facilities

The facilities required for reservoir expansion are listed below and shown on Figure 2. The size and/or location of some of the proposed facilities will vary, depending on the alternative. The range of alternative facility sizes and locations currently under consideration is described here.

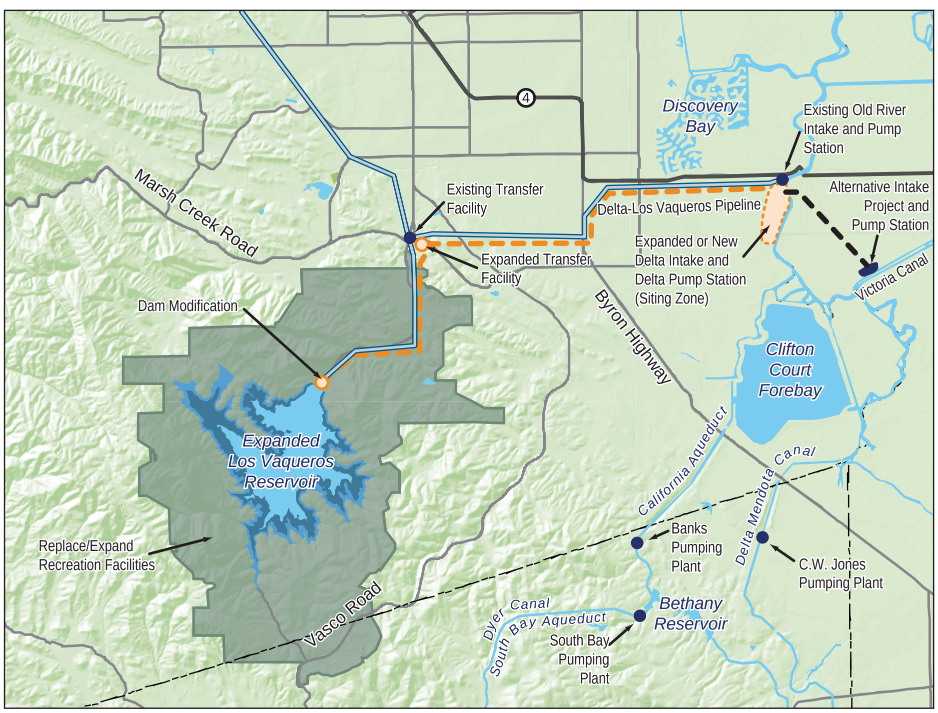
- **Delta Intakes**. Additional screened intakes in the Delta at Old River are being considered. The total intake capacity proposed for the expanded reservoir ranges up to 1,000 cubic feet per second (cfs) and would include CCWD's current 250 cfs intake capacity at Old River plus its approved 250 cfs Alternative Intake Project, with an additional intake capacity up to 500 cfs to be constructed as part of the expansion project along Old River.
- **Delta Pump Station**. A new or expanded Delta pump station and pipelines to connect the current and new Delta intakes to the new/expanded Delta pump station would be constructed. The total pumping capacity proposed for this pump station would match the total Delta intake capacity.
- **Delta - Los Vaqueros Pipeline.** A Delta - Los Vaqueros pipeline would be constructed to deliver water from the Delta pump station to the expanded reservoir via an expanded Transfer Facility. Installation of either one or two parallel pipelines with diameters ranging up to approximately 12 feet is under consideration.
- **Dam Modification and Reservoir Expansion**. Raising the dam and expanding the current 100,000-acre-foot capacity reservoir up to a maximum total capacity of 275,000 acre-feet is under evaluation.
- **Transfer - Bethany Reservoir Pipeline**. A pipeline connecting the expanded Transfer Facility to Bethany Reservoir that would deliver water from either Los Vaqueros Reservoir or the Delta for environmental purposes or for SBA Water Agencies.
- **Recreational facilities** relocation and expansion: marina, fishing piers, trails, picnic areas, and the interpretive center.

Other Alternatives

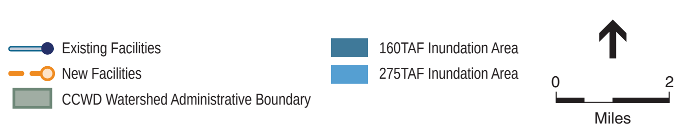
A No Action/No Project Alternative will be defined to characterize existing and probable future environmental conditions given the continued operation of existing water resource projects or facilities, such as the SWP and CVP, in combination with planned water resource projects or facilities that are approved or are authorized but not yet implemented.



Alternatives 1 and 2



Alternatives 3 and 4



SOURCE: USGS, 1993 (base map); and ESA, March 2008

Figure 2
Proposed Project Facility Alternatives

3.0 Opportunities for Public Comment

Notification

Reclamation and CCWD prepared and distributed several notification packages to inform interested parties of the scoping period and upcoming public scoping meetings.

On Tuesday, December 20, 2005, Reclamation published a Notice of Intent (NOI) in the Federal Register to advise interested agencies and the public that an EIS would be prepared. On January 10, 2006, CCWD published and distributed a Notice of Preparation (NOP) to advise interested agencies and the public that an EIR would be prepared. CCWD distributed the NOP to approximately 80 agencies, elected officials, and interested parties.

Interested parties were also notified about the public scoping meetings through a press release, general notification flyer, newspaper display advertisement, legal advertisement, and the project websites. The NOI, NOP, press release, display advertisements, legal advertisement, general notification flyer, and the project website notifications are presented in Appendices A, B, and C. Notifications provided basic project information; date, time, and location of meetings; and a brief explanation of the public scoping process and encouraged recipients to attend the open house/public scoping meetings. Reclamation distributed a press release on January 5, 2006. Reclamation prepared and CCWD mailed a notification flyer to approximately 2,000 interested organizations, agencies, elected officials, and residents on January 12, 2006.

CCWD published a display advertisement in the Central Zone and East Zone editions of the *Contra Costa Times*, a newspaper with regional distribution, on Wednesday, January 18, 2006, and Sunday, January 22, 2006. In addition, a legal advertisement was published Thursday, January 19, 2006. An electronic copy of the meeting display advertisement was posted on the CCWD project website, www.lvstudies.com, and the Reclamation project website, www.usbr.gov/mp/vaqueros.

The comment period extended through February 28, 2006. The public could submit written comments on the scope, content, and format of the environmental document by mail, fax, or email to representatives at CCWD and Reclamation.

Information Open House and Public Scoping Meetings

Reclamation and CCWD conducted four formal scoping meetings to gather input and comments prior to the development of the EIS/EIR. The tabulation below shows the dates and locations of the four meetings. Approximately 55 people attended the four meetings.

Sacramento, CA
Tuesday, January 24, 2006
1:30 to 3:30 p.m.
Department of Water Resources
Bonderson Building
(Public Hearing Room – 1st Floor)
901 P Street
Sacramento, CA 95814

Antioch, CA
Tuesday, January, 24, 2006
6:00 to 8:00 p.m.
Veteran's Memorial Building, Legion Hall
403 West 6th Street
Antioch, CA 94509

Livermore, CA
Wednesday, January 25, 2006
6:00 to 8:00 p.m.
Martinelli Event Center
Agricultural Center
3583 Greenville Road
Livermore, CA 94550

Concord, CA
Thursday, January 26, 2006
6:00 to 8:00 p.m.
Contra Costa Water District
1331 Concord Avenue
Concord, CA 94520

The format of each public meeting program was identical and began with a 45-minute open house during which participants could view exhibit boards with project information including an overview of the regional context, project objectives and purposes, alternatives, environmental issues, the environmental review process, and the project schedule. Participants were also encouraged to ask informal questions of project team members to understand the project objectives and alternatives.

Participants were encouraged to sign in and were provided with materials including an agenda, open house program, presentation slides, comment card, and speaker card. Copies of the NOI and NOP were available upon request.

A formal 15-minute presentation focused on the process, schedule, and role of public comments. Following the presentation, 60 minutes were allotted for public comments on the scope, content, and format of the environmental document. Comments were accepted in writing; a court reporter recorded oral comments.

Appendix D presents the informational materials, presentation slides, and exhibit boards used during the scoping meetings. Written and oral scoping comments, attendance sheets and meeting summaries are presented in Appendices E and F.

4.0 Summary of Scoping Comments

During the public scoping meetings held January 24, 25, and 26, 2006, participants were able to comment on the scope of issues to be included in the Los Vaqueros Reservoir Expansion Project EIS/EIR. Written comments were also collected throughout the public comment period. Appendix E presents transcripts of the oral comments received and Appendix F contains copies of the written comments received.

Commenting Parties

Comments were received from the following individuals and parties in response to the notices and opportunities provided.

TABLE 2
PARTIES SUBMITTING COMMENTS
DURING THE LOS VAQUEROS RESERVOIR EXPANSION PROJECT EIS/EIR SCOPING PROCESS

Name	Title	Organization
Written Comments		
John Negrete	Individual	
Robert Doran	Board President	Town of Discovery Bay CSD
John Nejedly	State Senator, Retired	
William Marshall	Chief, Storm Water Section	CA Regional Water Quality Control Board
Michael R. Williams	President	Mt. Diablo Audubon Society Conservation Committee
Brad Olson	Environmental Programs Manager	East Bay Regional Park District
Paul Piraino	General Manager	Alameda County Water District
Stanley Williams	CEO	Santa Clara Valley Water District
Dale Myers	General Manager	Zone 7 Water Agency
Seth Adams	Director of Land Programs	Save Mount Diablo
Katherine Osborn	Individual	
Lech Naumovich	East Bay Conservation Analyst	California Native Plant Society
Lori Clamurro	Environmental Scientist	Delta Protection Commission
Dennis O'Bryant	Acting Assistant Director	Department of Conservation Division of Land Resource Protection
Waltraud Heinritz	Individual	The Wolf Company
Oral Comments		
Bill Bennett	Chief, Office of Water Use Efficiency and Transfers	CA Department of Water Resources
Vicki Fry		Sacramento Regional County Sanitation District
Janess Hanson		Sierra Club - Delta Group
Karen Sweet		Alameda County Resource Conservation District
Gene Broadman	Individual	
Manuel Perry	Individual	
Pete Margiotta		California Waterfowl Association and Safari Club International
Lech Naumovich		California Native Plant Society
Tomi Van de Brooke		California Alliance for Jobs

Comments Received During the Scoping Process (Written and Oral)

Comments received during scoping are summarized in the list below. The comments are categorized by topic areas to enable easier review.

Project Description including Reservoir Operations

- Clarify who will construct, operate, and control an expanded reservoir.
- Identify location of proposed Delta Pump Station.

- Identify source of electrical power for pump stations and route of electrical lines.
- Coordinate facility siting with future city and county projects/expansions.
- Discuss the benefits and impacts of the current Los Vaqueros Reservoir as basis for evaluating the expanded reservoir project.
- Discuss the amount of material needed to construct a larger dam.

Alternatives

- Compare the project to other potential water storage projects identified by CALFED as warranting further study.
- Discuss alternative of terminating certain agricultural water supply contracts in the Central Valley and redirecting supply to domestic use.
- Evaluate alternatives that focus upon Delta levee repairs and water conservation measures instead of a reservoir expansion.
- Consider alternative that maintains the current reservoir and relocates the Delta intake facilities to Middle River.
- Review alternative that connects the existing Los Vaqueros Reservoir to the State Water Project at Bethany Reservoir instead of expanding Los Vaqueros Reservoir.
- Consider alternative of 25 TAF additional capacity to the existing Los Vaqueros Reservoir.
- Evaluate an alternative with a comprehensive conservation program.
- Assess alternatives that maintain consistency with assurances promulgated by the CCWD Board of Directors, including providing long-term environmental benefits to the Delta ecosystem and enhancing terrestrial habitat and recreational opportunities.

Biological Resources (including Fish Resources)

- Address impact on Pacific waterfowl migration from any unnatural rafting in the reservoir.
- Provide detailed information on impacts to protected plants and wildlife (including habitat and dispersal corridors), including direct and indirect effects to individual species and vegetative communities. In particular, consider effects on *Calochortus pulchellus* and *Thysanocarpos radians*. Consider permanent effects from inundation and temporal effects from construction of pipelines and project facilities.
- Discuss effects of managing for fish health on all ecosystems.

- Discuss impacts to endemic and migrating wildlife species from altering the landscape and attracting other wildlife species, including the introduction of invasive species (plants and avian species) and expansion of ranges of predatory species such as bullfrogs and predatory fish.

- Explain the impacts to areas with existing conservation easements and how those easements are addressed.

- Identify pipeline routing in Vasco Caves and Brushy Peak preserves, and discuss effects on conservation easements if applicable.

- Address mitigation needs including measures addressing compensation for previous mitigation implemented for the original Los Vaqueros Project.

- Evaluate effects of the project on habitat and aquatic species in local watersheds of the SBA where supplies are currently released.

- Address impacts on mitigation lands and feasibility of in-kind and in-watershed mitigation for sensitive species and habitat.

- Discuss impacts of additional pumping on fish resources, and Bay and Delta ecosystems.

- Expand Delta benefit beyond protection of Delta fish species.

- Assess effects on Delta species from operations of Reclamation/CCWD facilities at Old River, Mallard Slough, and Rock Slough.

Cultural/Historical Resources

- Include an evaluation of the potential impacts to cultural and historical resources in the watershed (including Vasco Caves and Brushy Peak) and conveyance corridors.

Surface Water Hydrology and Water Quality

- Discuss effects of levee failure on water quality in project area.

- Include impacts to the Delta and other Delta water users resulting from increased diversions at intake.

- Evaluate effect on flow from Discovery Bay wastewater discharge pipeline.

- Discuss impacts to water quality, including dissolved oxygen levels in the Delta.

- Discuss increased salinity intrusion due to global warming.

- Identify potential changes to water quality in the SBA including bromide, TOC, TDS, turbidity, pH, dissolved oxygen, taste and odor, algae, alkalinity and temperature.

- Evaluate effects of water quality changes on ability of SBA water users to treat water at their respective water treatment plants.
- Discuss potential effects of project on current and planned operations of the Del Valle Reservoir including effects on water quality in the Reservoir.

Water Supply

- Address potential construction and operational effects of the project on the SBA and water supplies.
- Discuss potential changes to daily, monthly and average SBA conveyance delivery capacity and SBA water supply reliability.
- Discuss potential effects of project on current and planned operations of the Del Valle Reservoir, including effects use of the reservoir for storage of local water supplies.
- Assess effects of project on potential SBA water supply outages resulting from major earthquakes or other reasons.
- The potential for Delta levee failure should be addressed in regard to project operations and reliable water supply.

Recreation

- Discuss impacts to current and proposed recreational facilities adjacent to the Los Vaqueros watershed, including regional trail systems and use.
- Evaluate opportunities to connect to surrounding recreational facilities.
- Include impacts to recreational activities dependent on the SBA.
- Consider relocation of recreational facilities in vicinity of habitat for special-status species.
- Discuss any potential policy changes to water quality standards at neighboring reservoirs that allow body contact.

Geology

- Investigate potential movements in the fault planes of the Delta and how they relate to project structures, as well as their effect on water quality.
- Evaluate potential effects of new facilities on seismic reliability and the potential for outages.

Land Use

- Discuss any potential impacts to agricultural lands (including range lands) or necessary acquisitions.
- Include a discussion of coordination and potential conflicts with the East Contra Costa Habitat Conservation Plan, including in particular the potential for mitigation land purchases for the expansion project to affect the cost of land acquisition for the HCP.
- Discuss whether Williamson Act contract termination would result from the project and whether such termination would affect nearby agricultural lands.
- Include potential benefits for agricultural operations.
- Use LESA model to determine significance.
- Identify potential impact that may occur in the Primary Zone of the Legal Delta resulting from activities occurring in the Secondary Zone and outside the Delta.

Transportation and Circulation

- Discuss impacts to local roadways, including Vasco Road, and necessary mitigation.
- Discuss mitigation for impacts to surrounding residents.

Construction-Related Issues

- Discuss construction-related effects to water quality.
- Include impacts during construction on surrounding residents.
- Discuss impact to recreational resources from closure of reservoir during construction.
- Discuss impacts of noise, dust, and glare on open space/rural environment.
- Evaluate traffic (including Highway 4 and local roadways), air quality and visual impacts during construction.
- Discuss access to Discovery Bay wastewater treatment facility during pipeline construction.
- Discuss construction disturbance to native plant populations.
- Discuss impact to water quality (salinity) when the existing reservoir is taken out of operation and CCWD diverts water out of Middle River (to the extent this might occur).

Growth-Inducing Effects

- Evaluate potential growth-inducing impacts.

Cumulative Effects

- The EIS/EIR should address the cumulative impacts from all freshwater diversion projects and pumping (from the Delta).
- Evaluate cumulative impacts to the Bay-Delta system considering other water users' activities.

Institutional Issues

- Discuss precedential effect of eliminating or changing conservation easement areas.
- Explain who will construct and operate the project and be responsible in the event of future dam failure.

Cost

- Provide detailed economic feasibility analysis.
- Discuss how funding will be secured even with a change in government administration.
- Analyze change in water treatment costs for SBA contractors.

General Comments

- Explain how the dam could be enlarged when previous studies indicated that was not possible.
- Include recreational hunting in the reservoir watershed.
- Include bike and horse access to trails.
- Coordinate with Contra Costa County to provide an emergency flood plan for incorporation into the County Emergency Plan.
- Evaluate funding needed to protect Delta levee system.
- Show that CCWD's commitments from the original Los Vaqueros Project will be followed.
- Include a discussion of planned coordination with agencies/organizations regarding permitting and mitigation plans.
- Consider potential to deliver agricultural water to the Livermore Valley.

- Discuss whether the project will facilitate the building of a peripheral canal.
- Consider formation of a long-term public agency to respond to levee failures and associated program for levee management and funding.
- Consider provision of multi-use regional trail within proposed rights of way of pipelines from Los Vaqueros to the SBA.
- Allow Byron and Discovery Bay residents access to reservoir recreational facilities to offset impacts from noise, dust and traffic delays.
- Discovery Bay prefers no pipeline or above ground structures at intersection of Discovery Bay Boulevard and Highway 4.

5.0 Consideration of Issues Raised in Scoping Process

A primary purpose of this Scoping Report is to document the process of soliciting and identifying comments from interested agencies and the public. The Scoping Process provides the means by which Reclamation and CCWD can determine those issues that interested participants consider to be the principal areas for study and analysis. Significant environmental issues that have been raised during scoping will be addressed in the EIS/EIR.

The following discussion identifies the issues raised in scoping that will be addressed in the EIS/EIR and provides a brief explanation for those issues that will not be considered in the document.

Project Description including Reservoir Operations

Issues pertaining to the ownership, operations, and control of the expanded reservoir will be summarized in the EIS/EIR.

The EIS/EIR will identify the location of facilities to the extent they are known. In the case of linear features like pipelines and power lines, a corridor is usually identified for purposes of the environmental analysis. The pipeline or power line would be specifically sited within this corridor during project design. Similarly, the Delta pump station location will be generally identified for purposes of the environmental analysis, and then specifically located within the area evaluated during project design.

The project will be described at a level of detail appropriate to the environmental analysis and will include an estimate of the quantity of material needed for the dam as well as sizes of facilities and equipment. Sources of power will also be identified.

The current Los Vaqueros Reservoir and related facilities will be described as background and as required to explain changes as a result of the expansion project.

Alternatives

The EIS/EIR will describe and discuss the direct and indirect environmental effects of implementing the proposed project and alternatives. The alternatives consist of a combination of optional physical features and operational scenarios, including facility sizes, locations, water supply purposes, and beneficiaries. A rigorous alternatives screening process has been undertaken to identify the alternatives to be included in the EIS/EIR. This process, including the full range of alternatives evaluated, screening criteria and outcomes will be summarized in the EIS/EIR and fully documented in an Appendix. Alternatives raised during scoping have been included in this screening process.

As part of the evaluation of alternatives, the EIS/EIR will address a No-Action Alternative. The existing environmental conditions will be described as a baseline condition. This description will include describing the current Los Vaqueros Reservoir and its associated benefits and impacts. The existing conditions will be the basis for evaluating future potential impacts of the expanded Los Vaqueros Reservoir.

Note: for each resource category listed below, the EIS/EIR will address the potential direct and indirect effects, as well as cumulative effects, associated with both construction and operation of the proposed project and alternatives. Mitigation measures will be recommended where appropriate to avoid, minimize, or offset significant environmental impacts.

Biological Resources (including Fish Resources)

The EIS/EIR will address the potential impacts on plants and wildlife that may occur as result of implementing the project alternatives. Specific attention will be placed on species protected by federal or state law or regulations.

The potential for induced invasive species and the potential for expansion of predatory species will be addressed, including introduced plants and avian species that may occupy the project area.

Mitigation will be identified and discussed, as appropriate. These measures will be developed in consultation with federal and state resource management agencies with regulatory authority over project implementation. Mitigation to compensate for impacts to previous mitigation efforts implemented to address the effects of the original Los Vaqueros Project facilities will be addressed, including discussion of the conservation easements that may be affected by the reservoir expansion.

Potential impacts on aquatic species and habitats, including the effects of changes in the timing and amounts of water diversions and pumping of Delta water supplies, will be addressed. The combined effect of operating the Old River, Mallard Slough, and Rock Slough diversions as well as the Alternative Intake Project, currently under construction, will be addressed to the extent that they will be altered with implementation of project alternatives or contribute to cumulative effects. Benefits of the project to aquatic species and habitats will also be described.

To the extent feasible, the EIS/EIR will consider whether the project will affect habitat and aquatic species or local watersheds where supplies are currently released.

Cultural/Historical Resources

The cultural and historical resources that may be affected by reservoir expansion facilities, including conveyance pipelines and inundation areas, will be assessed in accordance with the requirements of Section 106 of the National Historic Preservation Act, NEPA and CEQA.

Surface Water Hydrology and Water Quality

The EIS/EIR will assess potential changes in Delta hydrology and water quality using numerical models developed for the Sacramento-San Joaquin River/Delta system and commonly accepted for purposes of water resource planning and evaluation. The DSM2 model will be used to estimate changes in Delta water quality. This model uses electrical conductivity as an indicator of Delta water quality. The analysis will include water quality changes in the Delta as well as those affecting SBA users and reservoirs. The EIS/EIR will include a discussion of the effects of climate change on water quality and the potential for levee failure in the Delta to degrade water quality in the project area. The potential of the proposed project to affect flow from the Discovery Bay waste discharge diffuser will also be assessed.

Water Supply

The EIS/EIR will address potential changes to water volume to SBA users that may occur during short-term facility construction and long-term operations. The analysis will address changes to water supply reliability of SBA users. The CALSIM II model will be used to estimate changes to water supply and Delta flow conditions.

The SBA water users' water conveyance and storage systems will be assessed to determine changes in operations and effects on local supplies. Potential risk of facility outages due to earthquakes or other reasons will be assessed in comparison to existing facilities. The potential for levee failure to affect project operations and supply reliability will also be discussed.

Recreation

The EIS/EIR will discuss adverse effects on recreational facilities in the project area and potential adverse effects on nearby facilities and regional recreational trail systems. The environmental effects of re-locating existing facilities within the Los Vaqueros Watershed as a result of the expansion project will be evaluated.

The document will also address adverse effects on recreation facilities in other water storage reservoirs that could be affected by the expansion project alternatives.

Geology

The EIS/EIR will discuss potential impacts related to seismic ground shaking and seismic-related ground failure including liquefaction and landslides as well as issues related to seismic reliability.

Land Use

The potential effect of converting agricultural land to non-agricultural uses because of the expansion project will be assessed using U.S. Department of Agriculture Form AD-1006. Federal Site Assessment Scoring Criteria will be used to fill out the Farmland Conversion Impact Rating Form (AD-1006) and meet Farmland Protection Act (FPPA) requirements. Thorough consideration was given to using the California Department of Conservation Land Evaluation and Site Assessment (LESA) model in lieu of the federal model. Like the FPPA system, LESA is a point-based approach for rating the relative importance of agricultural land resources based upon specific measurable features. According to the Department website, the California LESA Model was developed to provide lead agencies with an optional methodology to ensure that potentially significant effects on the environment of agricultural land conversions are quantitatively and consistently considered in the environmental review process. However, because the EIS/EIR is a federal document, and because LESA model was designed primarily to evaluate single sites proposed for urban development rather than multiple sites and pipeline corridors, the federal system was selected for the agricultural impact evaluation.

Other agricultural issues such as potential effects on Williamson Act contracts will also be evaluated. The expansion project will be assessed for its effects on or consistency with the East Contra Costa County Habitat Conservation Plan. Additionally, consistency of the project with the Delta Protection Act and Delta Protection Commission guidelines will be evaluated.

Transportation and Circulation

Potential impacts to local roadways, including Vasco Road, which may occur during project construction, will be evaluated. As appropriate, mitigation will be identified to minimize project-related impacts.

Construction-Related Issues

The EIS/EIR will address construction-related issues in each resource category, and will include evaluation of the impact of construction on surrounding residents and land uses as well as mitigation to minimize these impacts.

The EIS/EIR will also address the potential impact of construction on terrestrial and aquatic biological resources including special-status plant populations and water fowl in the area.

Growth-Inducing Effects

Potential growth-inducing effects of constructing and operating an expanded Los Vaqueros Reservoir will be addressed in the EIS/EIR. This discussion will include potential growth-inducing effects in the SBA water users' service areas and areas near the reservoir.

Cumulative Effects

For each resource category, the EIS/EIR will include analysis of cumulative effects of the expanded Los Vaqueros Reservoir in combination with other past, present, and reasonably foreseeable future projects affecting the same resources. Where applicable, this analysis will address other diversion, pumping, utility and development projects in the geographic areas relevant to each resource.

Other Issues

Other issues to be addressed include the need to coordinate and plan for emergency conditions such as flooding. The document will include a summary of permitting requirements; a separate Mitigation Monitoring and Reporting Plan will also be prepared. The relationship of the proposed expansion project to other programs to improve the Delta habitat and fisheries, increase water supply reliability or improve water quality will be described in the EIS/EIR.

Other issues to be addressed, to the degree feasible, include the interaction and relationship of global warming on project operations and Delta resources.

Comments beyond the scope of the EIS/EIR

Comments related to feasibility and funding of the project that are not directly related to physical impact discussions within the environmental impact analysis will be addressed in the EIS/EIR to the extent required under NEPA and CEQA, and as relevant for each specific issue. Project benefits will be described qualitatively in the EIS/EIR.

Comments regarding changing future recreational uses in the watershed (e.g. allowing hunting) and access (e.g., extending customer benefits to non-customers) are policy issues for the CCWD Board of Directors and are not included in the environmental impact analysis.

Comments related to managing and funding Delta levees are not related to the environmental impact analysis and will not be addressed in the EIS/EIR. If appropriate, impacts related to levee improvement programs will be considered under cumulative impacts.

Appendix A
Notice of Intent

management, invasive species management, energy and minerals management, travel management, wilderness, wild horse herd management, cultural resource management, and other issues as appropriate.

These meetings are open to the public. The public may present written comments to the RACs. Each formal RAC meeting will also have time, as identified above, allocated for hearing public comments. Depending on the number of persons wishing to comment and time available, the time for individual oral comments may be limited.

Dated: December 14, 2005.

Juan Palma,

Las Vegas Field Manager, Designated Federal Officer for the Mojave Southern Great Basin RAC.

[FR Doc. 05–24241 Filed 12–19–05; 8:45 am]

BILLING CODE 4310–HC–M

DEPARTMENT OF THE INTERIOR

Bureau of Reclamation

Los Vaqueros Reservoir Expansion Investigation, Contra Costa County, CA

AGENCY: Bureau of Reclamation, Interior.

ACTION: Notice of intent to prepare an Environmental Impact Statement (EIS).

SUMMARY: Pursuant to section 102(2)(c) of the National Environmental Policy Act (NEPA), the Department of the Interior, Bureau of Reclamation (Reclamation) will prepare an EIS to evaluate expanding the existing Los Vaqueros Reservoir and alternatives to improve water supply reliability and water quality for Bay Area water users, particularly those receiving water from the Sacramento-San Joaquin Delta; and contribute to lower cost implementation of the CALFED Environmental Water Account (EWA). Pursuant to the California Environmental Quality Act, Contra Costa Water District will prepare an EIR on the proposed project concurrent with the EIS preparation. A joint EIS/EIR document will be prepared.

Reclamation was directed in Public Law 108–7, (Omnibus Appropriations Act of 2003) to conduct a feasibility-level investigation of the potential expansion of Los Vaqueros Reservoir.

DATES: Four scoping meetings will be held to solicit public input on the scope of the environmental document, alternatives, concerns and issues to be addressed in the EIS. The scoping meeting dates are:

- Tuesday, January 24, 2006, 1:30 to 3:30 p.m., Sacramento, CA.
- Tuesday, January 24, 2006, 6 to 8 p.m. Antioch, CA.
- Wednesday January 25, 2006, 6 to 8 p.m., Livermore, CA.
- Thursday, January 26, 2006, 6 to 8 p.m., Concord, CA.

Submit written comments on the scope of the environmental document to Reclamation at the address below by February 28, 2006.

ADDRESSES: The scoping meeting locations are:

- Sacramento—Department of Water Resources, the Bonderson Building, 901 P Street, Public Hearing Room first floor, Sacramento, CA 95814.
- Antioch—Legion Hall, Veteran's Memorial Building 403 West 6th Street, Antioch, CA 94509.
- Livermore—Martinelli Event Center, Agricultural Center, 3585 Greenville Road, Livermore, CA 94550.
- Concord—Contra Costa Water District, 1331 Concord Ave., Concord, CA 94520.

Written comments on the scope of the environmental document should be sent to Ms. Patricia Roberson, Bureau of Reclamation, Mid Pacific Regional Office, 2800 Cottage Way, Sacramento CA 95825–1898; by e-mail at *proberson@mp.usbr.gov*; or faxed to (916) 978–5094. Further information on the investigation, including the interim results, can be found at *http://www.usbr.gov/mp/vaqueros/.*

FOR FURTHER INFORMATION CONTACT: Patricia Roberson, Reclamation Project Manager at the above address, (916) 978–5074; or Ms. Marguerite Naillon, Project Manager, Contra Costa Water District, P.O. Box H2O, Concord, CA 94524, (925) 688–8018. If you would like to be included on the EIS/EIR mailing list, please contact Jennifer Allen, CirclePoint, at (415) 227–1100 ext. 33 or *j.allen@circlepoint.com.*

SUPPLEMENTARY INFORMATION:

Background

One of the five potential surface storage projects described in the CALFED Bay-Delta Program's long-term plan is the expansion of the existing Los Vaqueros Reservoir, an existing 100,000-acre-foot off-stream surface storage facility, located in Contra Costa County, California. The existing facility is owned and operated by the Contra Costa Water District (CCWD).

The primary study area includes the Los Vaqueros Reservoir watershed and associated dam and reservoir facilities, which are situated in the coastal foothills west of the Delta and east of the Bay Area, the central and south Delta, and service areas of Bay Area water agencies that may be directly affected by the project. The Bay Area water agencies that may be directly affected include Contra Costa Water District, Alameda County Water District, Santa Clara Valley Water district, and Alameda County Flood Control and Water Conservation District—Zone 7. Due to the potential influence on other programs and projects, an extended study area is defined to include the service area of the San Francisco Public Utilities Commission and the Central Valley of California.

Planning studies to date have focused on identifying water resources problems, needs, and opportunities in the primary study area, developing a set of planning objectives to help guide the remainder of the feasibility study, and formulating a set of initial alternatives. These elements of the study are summarized below.

Problems, Needs, and Opportunities

Water Supply Reliability. Deliveries of imported water to the Bay Area for drinking water supply are significantly reduced during dry years and critically dry years. Periods of multiple dry years can also occur, such as the droughts of 1928–1935 and 1976–1977, and most recently 1987–1992. These dry periods cause most local supplies, such as groundwater and locally stored runoff, to be depleted. At the same time, deliveries of imported water from the SWP and CVP are curtailed. Bay Area water agencies need to improve water supply reliability not only to reduce deficiencies during a drought, but also as an alternative supply in case of a catastrophic event or emergency in the Delta, such as a chemical spill or levee failure.

Environmental Opportunities. The Sacramento/San Joaquin Delta is the largest estuary on the West Coast and provides essential habitat for a diverse array of fish and wildlife. A variety of factors have contributed to the decline of fish species in the Delta, including the loss of habitat and water resources development. Water deliveries from the Delta have been curtailed in recent years to help protect threatened and endangered fish populations and their habitats. However, while pumping curtailments and other actions in the Delta have been beneficial to fish, they often have had adverse impacts on cities, farms, and businesses that depend on water supplies pumped from or through the Delta. Consequently, the Environmental Water Account (EWA) was developed to provide water project operators with additional flexibility in meeting or exceeding fishery requirements in the Delta.

Water Quality. Although State water quality standards have been maintained, the quality of water supplies from the Delta has generally declined because of salinity intrusion resulting from water resources development; polluted runoff from urban, agricultural, and other development; and changes to the physical environment. Because Bay Area water agencies typically blend water from various sources to attain a desired quality, water quality in the study area is a function of both water source and volume. Water providers in the study area use imported supplies from the Delta and local groundwater and surface water supplies.

Planning Objectives

The planning objectives identified below were developed based on the problems, needs, and opportunities in the study area.

- Increase water supply reliability for water providers within the study area, principally to help meet municipal and industrial water demands during drought periods, with a focus on enlarging Los Vaqueros Reservoir.
- Use an expanded Los Vaqueros Reservoir to develop replacement water supplies for the long-term EWA, if the cost of water provided from an expanded reservoir is found to be less than the cost of water for continued implementation of that program.
- To the extent possible through pursuit of the water supply reliability and environmental water objectives, improve the quality of water deliveries to municipal and industrial customers in the study area.

In addition to the study objectives, various planning constraints, principles, and criteria were identified and are being used to help guide the investigation. These criteria include the Contra Costa Water District's principles of participation.

Initial Alternatives

From the Planning Objectives, a number of water resources management measures were identified. The most effective of these measures were used to formulate a set of initial alternatives. The initial action alternatives, still under refinement, include the following elements:

- Different ways to increase reservoir capacity: Raise the existing dam in-place or replace it completely with a new dam;
- Different ways/points of connection to deliver water to Bay Area users via facilities of the State Water Project;
- Different reservoir expansion sizing and operations geared to meet the project objectives: Water supply reliability, EWA needs, and/or water quality.

Specific measures and combinations of measures in these initial alternatives will likely change in future studies and some may be combined with others or dropped from further consideration. Other measures and combinations of measures may emerge during the scoping process and warrant development into alternatives. In addition to the action alternatives, the No Action alternative will also be evaluated. Additional information on these initial alternatives is contained in the Los Vaqueros Expansion Investigation, California, Initial Alternatives Information Report at *http://www.usbr.gov/mp/vaqueros/.*

Additional Information

The environmental review will be conducted pursuant to NEPA, the Endangered Species Act, and other applicable Federal law, to analyze the potential environmental impacts of implementing a range of feasible alternatives, including Los Vaqueros Reservoir expansion. Public input on the range of alternatives to be considered will be sought through the initial public scoping meetings.

Our practice is to make comments, including names and home addresses of respondents, available for public review. Individual respondents may request that we withhold their home addresses from public disclosure, which we will honor to the extent allowable by law. There also may be circumstances in which we would withhold a respondent's identity from public disclosure, as allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public disclosure in their entirety.

Frank Michny,

Regional Environmental Officer, Mid-Pacific Region.

[FR Doc. E5–7541 Filed 12–19–05; 8:45 am]

BILLING CODE 4310–MN–P

INTERNATIONAL TRADE COMMISSION

[Investigation Nos. 731–TA–344, 391–A, 392–A and C, 393–A, 394–A, 396, and 399–A (Second Review)]

Certain Bearings From China, France, Germany, Italy, Japan, Singapore, and the United Kingdom

AGENCY: United States International Trade Commission.

ACTION: Revised schedule for the subject investigations.

EFFECTIVE DATE: December 9, 2005.

FOR FURTHER INFORMATION CONTACT: Debra Baker (202–205–3180), Office of Investigations, U.S. International Trade Commission, 500 E Street, SW., Washington, DC 20436. Hearing-impaired persons can obtain information on this matter by contacting the Commission's TDD terminal on 202–205–1810. Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000. General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*). The public record for these investigations may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov.*

SUPPLEMENTARY INFORMATION: On October 12, 2005, the Commission established a schedule for the conduct of the final phase of the subject investigations (70 FR 60556, October 18, 2005). Subsequently, the Commission received a request from an interested party to change the scheduled date for the public hearing. The Commission, therefore, is revising its schedule.

The Commission's new schedule for the investigations is as follows: requests to appear at the hearing must be filed with the Secretary to the Commission not later than April 20, 2006; the prehearing conference will be held at the U.S. International Trade Commission Building at 9:30 a.m. on April 25, 2006; the prehearing staff report will be placed in the nonpublic record on April 7, 2006; the deadline for filing prehearing briefs is April 21, 2006; the hearing will be held at the U.S. International Trade Commission Building at 9:30 a.m. on May 2, 2006; the deadline for filing posthearing briefs is May 11, 2006; the Commission will make its final release of information on June 6, 2006; and final party comments are due on June 8, 2006.

For further information concerning these investigations see the

Appendix B
CEQA Agency Consultation and Public Scoping

Appendix B-1

Notice of Preparation

NOTICE OF PREPARATION

Environmental Impact Report for the Los Vaqueros Reservoir Expansion Project

1.0 Introduction

The Contra Costa Water District (CCWD) is the lead agency under the California Environmental Quality Act[1] (CEQA) for preparation of an Environmental Impact Report (EIR) on the proposal to expand Los Vaqueros Reservoir. The reservoir, owned and operated by CCWD, is a 100,000-acre-foot off stream surface storage facility, located in Contra Costa County, California.

Expansion of Los Vaqueros Reservoir (project) is one of the potential surface storage projects described in the CALFED Bay-Delta Program's long-term plan that was recommended for additional study. The CALFED long-term plan recognized that additional storage at Los Vaqueros Reservoir could contribute to improving the quality of Bay Area drinking water supplies delivered from the Sacramento-San Joaquin Delta (Delta), the reliability of Bay Area water supplies, and Delta fisheries resources adversely affected by actions taken to manage the Delta's water resources. While the CALFED long-term plan provides some planning background, this project analysis does not tier from the CALFED Plan Programmatic EIS/EIR and the project is proposed independent of any decision to proceed with any other project within the CALFED plan.

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) is the lead agency under the National Environmental Policy Act[2] (NEPA) for preparation of an Environmental Impact Statement (EIS) and, in conjunction with CCWD, will prepare a joint EIS/EIR document for the project.

This Notice of Preparation (NOP) describes the currently proposed project alternatives under consideration for review in the EIS/EIR and identifies the main environmental issue areas to be addressed during the environmental review. However, project alternatives are still under development and will be refined further during the EIS/EIR preparation process. Agencies and interested members of the public are invited to provide input on the scope of the environmental analysis and the range of alternatives to be evaluated.

1 California Public Resources Code §§21000–21178

2 Pub. L. 91-190, 42 USC 4321-4347, January 1, 1970, as amended by Pub. L. 94-52, July 3, 1975, Pub. L. 94-83, August 9, 1975, and Pub. L. 97-258, § 4(b), Sept. 13, 1982)

1.1 Opportunities for Public Participation

The public is invited to submit oral and/or written comments on the scope of issues to be included in the EIS/EIR. **The comment period extends through February 28, 2006.** Interested persons and organizations are invited to call Jennifer Allen at CirclePoint, 415-227-1100, ext. 33, or to email her at lvstudies@hotmail.com to be included on the mailing list for public meetings or to receive other correspondence concerning the project.

Scoping Meetings

Scoping meetings have been scheduled between January 24 and January 26, 2006, at the four locations shown below:

- **Sacramento, CA**
  Tuesday, January 24, 2006
  1:30 p.m. to 3:30 p.m.
  Public Hearing Room, first floor
  Bonderson Building
  901 P Street
  Sacramento, CA 95814

- **Livermore, CA**
  Wednesday, January 25, 2006
  6:00 p.m. to 8:00 p.m.
  Martinelli Event Center
  Agricultural Center
  3585 Greenville Road
  Livermore, CA 94550

- **Antioch, CA**
  Tuesday, January 24, 2006
  6:00 p.m. to 8:00 p.m.
  Legion Hall
  Veteran's Memorial Building
  403 West 6th Street
  Antioch, CA 94509

- Concord, CA
  Thursday, January 26, 2006
  6:00 p.m. to 8:00 p.m.
  CCWD Board Room
  1331 Concord Avenue
  Concord, CA 94520

Written Comments

Please submit any comments by the end of the public comment period on February 28, 2006 by 5 p.m. Written comments on the scope, content, and format of the environmental document can be emailed, using the link from the website, www.lvstudies.com, and clicking on "Contact and Comment." Written comments may be also mailed or faxed to representatives at the following addresses:

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2.0 Proposed Project

2.1 Project Planning

During 2002 and 2003, preliminary engineering, environmental, and cost assessment studies were conducted that culminated with the preparation and distribution of the draft *Los Vaqueros Reservoir Expansion Studies Planning Report* (Planning Report) in April 2003. The Planning Report describes the reservoir expansion concept including the facilities required, sizing options, operations, and the potential benefits and objectives such a project could achieve, as well as an initial evaluation of the potential environmental impacts of expansion. An extensive series of public workshops was held during the development of the report. Comments received as a result of the public workshop and responses were incorporated into the final Planning Report in April 2004. The Planning Report and other studies completed to date are available for review at CCWD's office and can be downloaded from the Los Vaqueros Reservoir Expansion Project website at www.lvstudies.com.

Reclamation was directed by federal law (PL 108-7) to conduct a feasibility-level evaluation of the potential expansion of Los Vaqueros Reservoir. Reclamation is proceeding with preparation of a federal Feasibility Study for the project. The first step in the development of the Feasibility Study was the preparation of an Initial Alternatives Information Report, published in November 2005 (available for review at CCWD's office and online at www.lvstudies.com and www.usbr.gov/mp/vaqueros). As part of that study effort, the project objectives were refined and potential project alternatives recommended for further evaluation were identified.

Figure 1 presents the study area for the project. The primary study area includes the Los Vaqueros watershed and associated dam, reservoir, and support facilities, which are situated in eastern Contra Costa County, in the coastal foothills west of the Delta and east of San Francisco Bay; the central and south Delta; and the service areas of Bay Area water agencies that may be directly affected by the project. These agencies include CCWD as well as the three agencies that receive their State Water Project (SWP) water via the South Bay Aqueduct (SBA): Alameda County Flood Control and Water Conservation District, Zone 7; Alameda County Water District; and Santa Clara Valley Water District. Other agencies that may be affected include the San Francisco Public Utilities Commission or other Bay Area water agencies. Due to the potential influence on other programs and projects, an extended study area for this project encompasses the Central Valley region.

2.2 Project Objectives

This project has two primary objectives and one secondary objective:

Primary Objectives:

1. Use an expanded Los Vaqueros Reservoir to develop replacement water supplies for a fisheries protection program such as the long-term Environmental Water Account (EWA) program or an equivalent program, if the cost of water provided from an

SOURCE: USGS, 1993 (base map); and ESA, 2005

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Figure 1
Regional Study Area

expanded reservoir is found to be less than the cost of water from other sources for continued implementation of that program.

2. Increase water supply reliability for water providers within portions of the San Francisco Bay Area including those served by the South Bay Aqueduct (SBA), principally to help meet municipal and industrial water demands during drought periods, with a focus on enlarging Los Vaqueros Reservoir.

Secondary Objective:

3. To the extent possible through the pursuit of the water supply reliability and environmental water objectives, improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area study area.

In addition to these objectives, various planning constraints, principles, and criteria were identified to help guide the investigation. CCWD Board of Directors' Resolution No. 03-24, June 25, 2003, provides important guidance for identifying and evaluating plans involving the expansion of Los Vaqueros Reservoir.

Environmental Opportunities—Reduce Cost of Water Supplies Available for Fisheries Protection

Introduction

The Sacramento-San Joaquin Delta, the largest estuary on the West Coast, provides essential habitat for a diverse array of fish and wildlife. A variety of factors have been identified as potential contributors to the decline of fish species in the Delta, including the loss of habitat, introduced species, pollutants entering the Delta, and water resources development. Prior to 2001, water deliveries from the Delta were curtailed at times to help protect threatened and endangered fish populations and their habitats. However, while such pumping curtailments and other actions in the Delta were beneficial to fish (by reducing entrainment and injury at the pumps), they occasionally had adverse impacts on cities, farms, and businesses that depend on water supplies pumped from or through the Delta. Consequently, a program called the Environmental Water Account (EWA) was developed in August of 2000 as part of the CALFED Program to provide additional flexibility in the protection and recovery of certain fish species in the Delta.

Improving Delta fisheries by supporting a fisheries protection program such as the EWA is a chief objective of the proposed project. The EWA program has currently been authorized to operate through 2007 and a proposal for long-term extension of the EWA program through the year 2030 is now under state and federal environmental review. The current EWA program is described here to explain how such a fisheries protection program works and how an expanded reservoir project could meet the needs of and improve such a program. If, for any reason, the current EWA program is not extended for long-term implementation, the reservoir expansion project would remain committed to supporting an equivalent type of fisheries protection program.

Existing Environmental Water Account (EWA) Program

The purpose of the EWA is to provide water for the protection and recovery of at-risk native fish species of the Bay-Delta estuary beyond water available through existing regulations and fishery restoration programs. Initially a four-year program that began operating in 2001, the EWA was recently extended for three additional years to December 31, 2007. A long-term EWA program proposal to extend this program through the year 2030 is now under environmental review.

The EWA is a cooperative management program that authorizes curtailment of State Water Project (SWP) and Central Valley Project (CVP) exports to benefit fisheries by acquiring water supplies, called EWA assets, from willing sellers throughout California and by using operational flexibility of the CVP and SWP facilities to pump and store EWA water. EWA water is then used to augment stream flows, augment Delta outflows, and replace project water supplies reduced during export pumping curtailments.

To date, the EWA has obtained the great majority of its water through annual transfer agreements with willing sellers, and is developing longer-term agreements with some of its transfer partners. The EWA can also use excess capacity at the SWP Banks Pumping Plant to obtain water from the Delta in excess of the flows required to maintain current water quality standards and water rights demands, can capture certain releases of environmental flows that reach the Delta, and can also use dedicated capacity of 500 cubic feet per second (cfs) at the SWP Banks Pumping Plant to move transfer supplies though the Delta in July through September.

The state and federal EWA Agencies have a goal of developing additional longer-term water transfer/supply agreements and obtaining dedicated facility and water right assets to increase water supply reliability and reduce market-dependent annual cost fluctuations. South-of-Delta storage capability, along with the ability to fill that storage without reliance on the SWP and CVP Delta pumps and a means of returning the stored water to the projects to offset pumping curtailments, would substantially benefit the EWA. An expanded Los Vaqueros Reservoir could provide additional south-of-Delta storage capacity for the EWA or equivalent type of program. Such an arrangement would allow more reliable supply acquisition, would increase flexibility in returning water to the projects, and would help prevent stored assets from being spilled (displaced) from SWP or CVP reservoirs.

Need to Increase Water Supply Reliability

Diversion of Delta water supplies is significantly reduced during dry years and critically dry years. Periods of multiple dry years can also occur, such as the droughts of 1928–1935, 1976–1977, and 1987–1992. These dry periods cause most local supplies, such as groundwater and locally stored runoff, to be depleted. At the same time, deliveries of Delta water via the SWP (operated by the California Department of Water Resources) and federal CVP (operated by Reclamation) are curtailed. Bay Area water agencies need to improve water supply reliability not only to reduce deficiencies during drought, but also as an alternative supply in case of a catastrophic event or emergency in the Delta, such as a chemical spill or levee failure.

As an example of drought period reductions in Delta water supply, SWP deliveries can be reduced from an average of 68 percent of the contracted water supply (Table A) to about 4 percent of the contracted water supply during a single dry year with conditions similar to those in 1977.[3] A four-year drought, similar to the period of 1931 to 1934, would result in reducing SWP deliveries to about 32 percent of full Table A deliveries. Extended droughts may result in some Bay Area water agencies being unable to meet fully current or future water demands, even with the use of aggressive demand management techniques.

Need to Improve Drinking Water Quality

Although state water quality standards have been met under most conditions, the quality of water supplies from the Delta has generally declined because of salinity intrusion resulting from water resources development; polluted runoff from urban, agricultural, and other development; and changes to the physical environment. Because Bay Area water agencies typically blend water from various sources to attain a desired quality, water quality in the study area is a function of both water source and volume. Water providers in the study area use imported water supplies from the Delta along with local groundwater and surface water. Seasonal variations as well as longer-term degradation of Delta water quality result in elevated salinity, total dissolved solids, bromide, total organic carbon, and algae concentrations and high levels of hardness and turbidity. As a result, some drinking water supplies originating in the Delta are subject to water treatment challenges for utilities, taste and odor problems for consumers, and possible increased health risks for some individuals.

2.3 Project Alternatives

As noted in the Introduction of this document, project planning studies performed to date have developed a range of potential project alternatives for analysis in the EIS/EIR. These potential project alternatives are described below.

Reservoir Expansion Alternatives

Delivery Objectives and Operations

A range of reservoir expansion alternatives has been developed for further detailed evaluation. The alternatives include the following elements:

- Different reservoir expansion sizing and operations geared to meet different combinations of the two primary project objectives: improve supply reliability and provide environmental water, and

- Different conveyance options (i.e., pipeline or tunnel) and alternative points of connection to deliver water to Bay Area users via facilities of the SWP (i.e., connect to the SBA at Dyer Canal or Bethany Reservoir).

[3] Department of Water Resources, 2005. The State Water Project Water Reliability Report–Public Review Draft. November 2005 (Table B-2).

The expanded reservoir would be operated similarly to the existing Los Vaqueros Reservoir: high-quality water would be diverted from the Delta for storage in the expanded reservoir. CCWD now uses Los Vaqueros Reservoir to capture high-quality flows from the Delta to blend later with more saline Delta supplies. An expanded reservoir would allow more high-quality water to be diverted into storage when surplus water (in excess of all other needs) is available in the Delta and when fish impacts are low. This situation would typically occur in the wetter months.

Currently, the reservoir operation is controlled by the water quality needs of CCWD and this would remain a key operational factor for the expanded reservoir. Like the current reservoir, an expanded reservoir would also be operated in accordance with other Delta operations, water-rights permits, the requirements of applicable biological opinions issued by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for Endangered Species Act compliance and memoranda of understanding issued by the California Department of Fish and Game for species protection.

Required Facilities

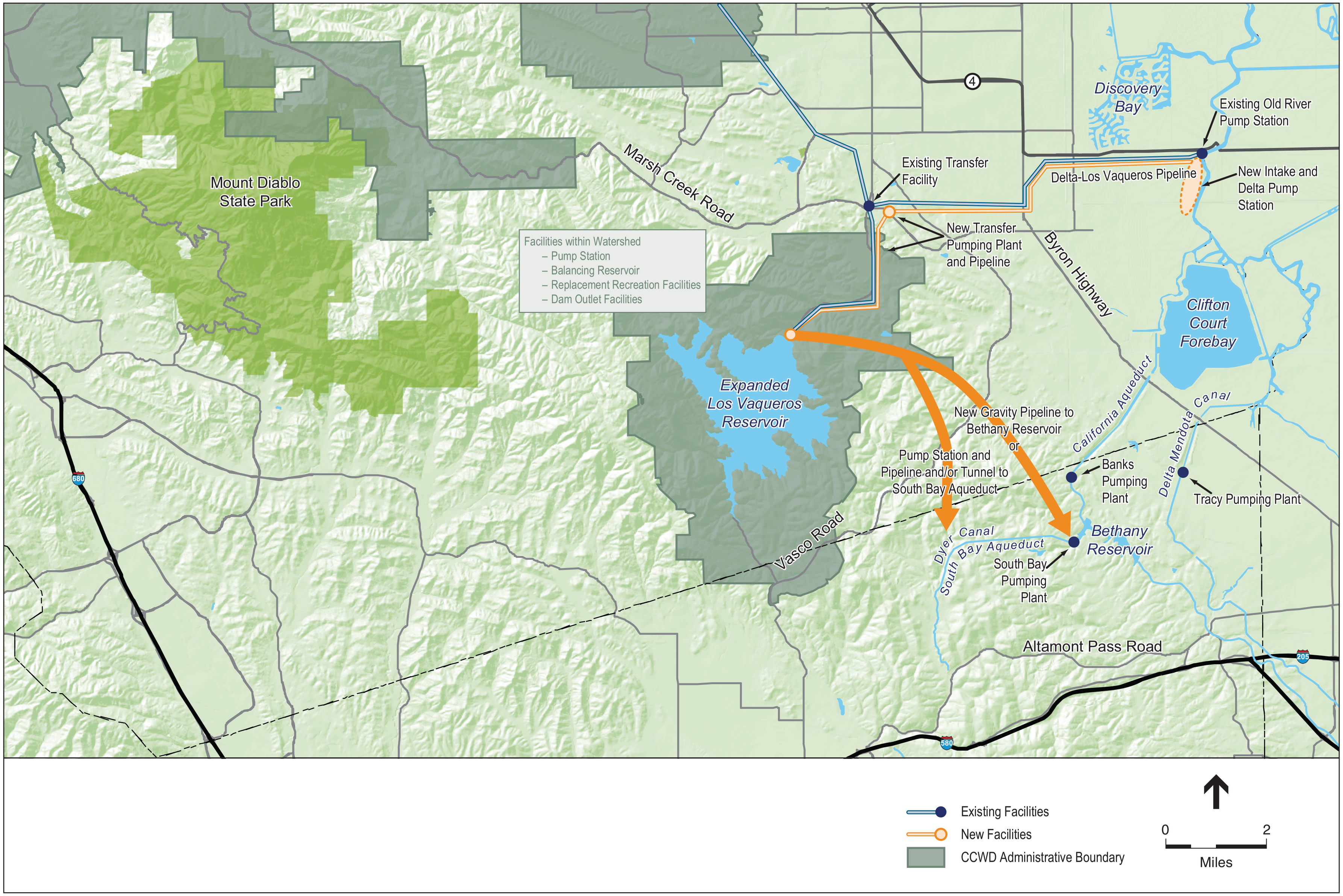
The facilities required for reservoir expansion are listed below and shown on Figure 2. Section 3.0 describes the current Los Vaqueros Reservoir Project facilities and provides background on reservoir operations. The size and/or location of some of the proposed facilities will vary, depending on the alternative. The most appropriate size and location of each facility under each alternative is still being refined and this will be presented in the EIS/EIR. The range of alternative facility sizes and locations currently under consideration is described here.

- **Delta Intakes**. Additional screened intakes in the Delta at Old River are being considered. The total intake capacity proposed for the expanded reservoir ranges from 1,250 cfs to 1,750 cfs and would include CCWD's current 250 cfs intake capacity at Old River plus its proposed 250 cfs Alternative Intake Project (described below) with up to an additional 1,250 cfs of intake capacity to be constructed as part of the expansion project along Old River.

- **Delta Pump Station**. A new Delta pump station and pipelines to connect the current and new Delta intakes to the new Delta pump station would be constructed. The total pumping capacity proposed for this pump station would match the total Delta intake capacity.

- **Delta-Los Vaqueros (Delta-LV) Pipeline.** A Delta-LV pipeline would be constructed to deliver water from the Delta pump station to the expanded reservoir. Installation of either one or two parallel pipelines with diameters ranging up to approximately 12 feet is under consideration.

- **Dam Modification or Replacement and Reservoir Expansion**. The options of either raising the existing dam or replacing it with a new dam are both under evaluation to expand the current 100,000-acre-foot capacity reservoir up to a maximum of 500,000 acre-feet. A range of expanded reservoir sizes between



SOURCE: USGS, 1993 (base map); and ESA, 2005

Los Vaqueros Reservoir Expansion Project EIS/EIR . 201110

Figure 2
Proposed Project Facility Alternatives

100,000 acre-feet and 500,000 acre-feet is being evaluated. Figure 3 shows the inundation footprints for expanded reservoirs totaling 300,000 acre-feet and 500,000 acre-feet. Table 1 summarizes several key physical features for the current and an expanded reservoir.

- **Los Vaqueros Watershed Recreational Facilities.** Current facilities, including the marina, fishing piers, trails, picnic areas, and the interpretive center, would be relocated and expanded.

- **Dam Outlet Facilities.** A dam outlet pipeline, flow control station, and balancing reservoir to deliver water from the expanded reservoir to CCWD's existing pipelines would be needed.

- **Los Vaqueros – South Bay Aqueduct (LV-SBA) Pipeline**. Facilities include either a pump station and an LV-SBA pipeline connecting the expanded Los Vaqueros Reservoir directly to the SBA at Dyer Canal, a combination pump station/tunnel/ pipeline connecting the expanded reservoir to the SBA at Dyer Canal, or a gravity pipeline (without pump station) connecting to the SBA pumping plant at Bethany Reservoir that would convey water to the Bay Area water agencies served by the SBA.

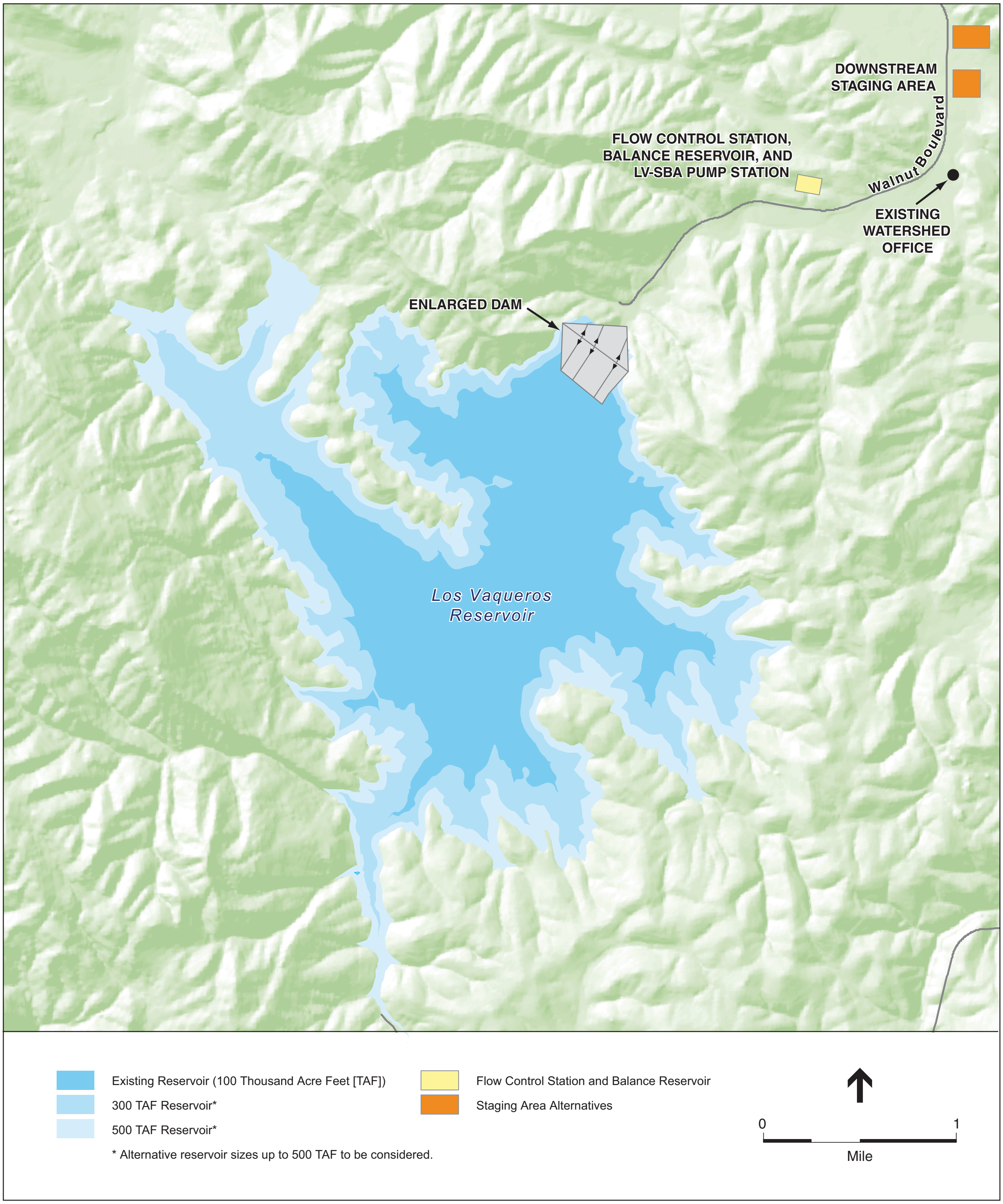
CCWD and Reclamation are now conducting CEQA/NEPA review on CCWD's proposed Alternative Intake Project (AIP). The AIP is a water quality improvement project to construct a new intake in the Central Delta on Victoria Canal to be used when water quality is better at the new intake than at the existing Old River Intake. The AIP is being designed for use with CCWD's current water supply system and is proposed independently from an expanded Los Vaqueros Reservoir. An expanded reservoir project may increase total diversions at the combined intakes at Old River and the AIP intake, as well as make use of the new intakes on Old River proposed as part of the expansion project. The effects of such changes in timing and quantity of diversions will be addressed in the EIR/EIS for the project.

Construction of a new dam would take three to four years to complete, depending on the size of the dam being constructed. The construction of other major facilities, such as the Delta-LV pipeline and LV-SBA pipeline alternatives, could take up to three years. Based on these estimates, the overall project construction could reasonably take up to five years when contractor mobilization and demobilization activities are included.

Other Alternatives

Public and agency input during the scoping process for the EIS/EIR may identify other alternatives for consideration. These will be evaluated in comparison to the proposed reservoir expansion project. Ongoing analysis as part of the federal Feasibility Study will determine if there are any other alternatives to reservoir expansion that should be evaluated further.

In addition, in accordance with the requirements of both CEQA and NEPA, the EIS/EIR will evaluate a No Action/No Project Alternative. A No Action/No Project Alternative will be defined



SOURCE: USGS, 1993 (base map); and ESA, 2005

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Figure 3
Alternative Expanded Reservoir Sizes

TABLE 1
COMPARISON OF ALTERNATIVE RESERVOIR SIZES

Comparison Feature	Current 100,000-Acre-Foot Reservoir (No Project Alternative)	300,000-Acre-Foot Expanded Reservoir	500,000-Acre-Foot Expanded Reservoir
Maximum Water Surface Elevation (Feet Above Mean Sea Level)	472	567	636
Total Reservoir Acreage (Acres)	1,500	2,600	3,300
Net Acreage Increase of Reservoir (Acres)	–	1,100	1,800
Volume of Dam Embankment (Cubic Yards)	2,850,000	10,750,000	18,500,000

SOURCE: CCWD, Los Vaqueros Reservoir Expansion Studies Planning Report, 2004

to characterize current and probable future environmental conditions, given the continued operation of water resource projects or facilities, such as the SWP and CVP, in combination with planned water resource projects or facilities that are approved or are authorized but not yet implemented.

3.0 Description of Existing Los Vaqueros Project

The current Los Vaqueros Reservoir, as shown in Figure 4, is located in eastern Contra Costa County, California. CCWD owns and operates the facility for the benefit of its customers. The reservoir and ancillary features were placed into operation in 1998.

The Contra Costa Canal and Los Vaqueros Project constitute CCWD's principal water supply and delivery system. Water is diverted at the Old River Intake/ Pump Station, where it is either conveyed to the reservoir for storage or to the CCWD service area for direct use.

Figure 4
Current Los Vaqueros Reservoir

The current Los Vaqueros Project consists of a storage reservoir behind a 200-foot-high dam, more than 18 miles of 72- to 96-inch piping, a screened intake at Old River, and two pump stations (the Old River Pumping Plant and the Transfer Facility) with a capacity of 250 cfs.

The current Los Vaqueros Reservoir has a storage capacity of up to 100,000 acre-feet. Water diverted from the Delta is conveyed to the reservoir when high-quality supplies are available. This water is later released and blended with more saline Delta water supplies to meet CCWD's water quality objectives. The CCWD Board of Directors has adopted water quality objectives in order to keep constituents of major health concern at the lowest levels that are technically feasible and provide its customers with a consistent supply of safe, aesthetically-pleasing, high-quality water.

Additional facilities, including recreational facilities that make available both water-oriented and upland recreational opportunities, have been constructed and are operational.

CCWD uses the Los Vaqueros Project to capture high-quality flows from the Delta to blend with CVP supplies when Delta water quality is degraded by either salinity intrusion or by discharges into the Delta and its tributary streams. With the Los Vaqueros Project, CCWD can reduce or eliminate Delta diversions during sensitive periods for Delta fisheries, increase diversions when fish are not in abundance, and shift diversions between intakes. The reservoir also provides important emergency storage that can be used if, for any reason, CCWD is unable to divert water from the Delta.

The operation of Los Vaqueros Reservoir is controlled by CCWD's water quality and supply needs, in accordance with Delta operations, water-rights permits, the requirements of biological opinions issued by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service and a memorandum of understanding with the California Department of Fish and Game. The biological opinions identify measures that were adopted as part of the Los Vaqueros Project to mitigate or avoid impacts to federally listed threatened or endangered species.

4.0 Environmental Issues to Be Addressed in the EIS/EIR

Following is an overview of the environmental issues that the EIS/EIR will address for the project. The EIS/EIR will examine the potentially significant environmental effects in each of the environmental issue areas outlined below, identify mitigation measures, and evaluate whether such measures can reduce impacts to a less-than-significant level.

The studies completed to date (the 2004 Planning Report and the 2005 Initial Alternatives Information Report, available for review from CCWD or online at www.lvstudies.com) have provided a preliminary assessment of the environmental effects of the project. The EIS/EIR will fully analyze all potential environmental effects of the project alternatives in accordance with NEPA and CEQA requirements.

4.1 Aesthetic Resources (Visual Resources)

Effects on visual quality associated with implementation of the proposed project would primarily result due to the siting of new or modified facilities. Under the proposed project a larger dam than now exists would be constructed and the expanded reservoir would inundate a larger area of grassland and oak woodland. New facilities, including a new Delta pump station and new in-bank intake facilities would be constructed in the Delta area. Construction activities would result in short-term visual changes associated with equipment and materials storage and movement as well as earthwork. Potential effects to be evaluated include:

- Degradation or obstruction of scenic views and designated scenic resources
- Creation of new sources of light and/or glare

4.2 Agricultural Resources

Siting of new or modified facilities in the Delta and eastern Contra Costa County could affect agricultural lands by removing agricultural soils from production. Project siting studies to date have endeavored to minimize effects on agricultural lands. Construction activities could cause short-term impacts to agricultural activities. Operation of proposed facilities is not expected to result in ongoing impacts to neighboring agricultural activities. Potential effects to be evaluated include:

- Loss of farmland
- Impacts or conflicts with existing or planned agricultural activities

4.3 Air Quality

Effects on air quality from implementation of the project would largely be associated with facility construction activities and, as such, would be temporary and short term. Construction activities would result in short-term increases in air pollutant emissions and dust generation due to earthwork, construction equipment movement, and vehicle emissions. In addition, new pump stations may involve backup energy supply sources that will be evaluated for air emissions. Potential effects to be evaluated include:

- Construction emissions, including dust
- Consistency with regional air quality plans

4.4 Biological Resources

Construction of the project would have impacts resulting in the loss of habitat due to the expansion of the reservoir inundation area and, to a lesser extent, the siting of new or modified facilities. Project construction would also disturb terrestrial habitats and wildlife as a result of short-term effects such noise, vibration, dust, and erosion.

Expanding Los Vaqueros Reservoir up to a 500,000-acre-foot facility could inundate up to approximately 1,960 acres, affecting mostly grassland habitat and other habitats as well as the plant and animal species that now occupy these lands. Construction of new or modified facilities in addition to reservoir expansion could affect up to another approximately 200 acres, again primarily grassland. Several special-status plant and animal species are known or are expected to reside in the watershed, inundation area, and other project construction zones. These species are designated for special management and protection according to federal and state statutes. Potential effects to be evaluated include:

- Changes in the extent of habitat or habitat quality for terrestrial plants and wildlife
- Effects on special-status species
- Effects on species populations and the ability to maintain self-sustaining levels
- Interference with wildlife species movement corridors or migration

4.5 Cultural Resources (Including Historic Resources)

Project facilities could have potential adverse effects on known cultural resources. There is also the potential to affect previously unknown buried cultural resources, especially near creeks and other sensitive areas. Based on previous evaluations, there are 74 known cultural resources and one sensitive location within the Los Vaqueros Reservoir expansion study area, including the watershed and alternative conveyance pipeline corridors. Potential effects to be evaluated include:

- Effects on archaeological resources
- Effects on historic/architectural resources
- Effects on Indian Trust assets and Native American resources

4.6 Fisheries

The reservoir expansion project has been designed to address one of the primary objectives of providing protection for Delta fisheries. Potential effects on fish of altering the timing and location of current Delta water diversion pumping for the Bay Area water users will be evaluated. The effect of constructing new diversion facilities in the Delta will also be evaluated for potential effects on aquatic habitat and short-term effects on fisheries resources. Potential effects to be evaluated include:

- Changes in the extent of habitat or habitat quality
- Changes in a fish population that cause it to drop below self-sustaining levels
- Effects on special-status species
- Interference with the movement of any native or migratory fish species

4.7 Geology and Soils (Including Mineral Resources)

Potential geologic hazards will be assessed to determine if the implementation of the expansion alternative would pose a threat or increase the severity of a hazard to human populations. The potential effect of accelerated soil erosion will be assessed. Both the short-term erosion potential anticipated during construction and the long-term erosion potential that may occur from reservoir shoreline wave action will be addressed. Potential effects to be evaluated include:

- Seismic hazards to the water system and/or increased exposure of people and structures to seismic hazards
- Increased exposure of people or structures to geologic hazards (such as liquefaction, poor soil conditions, or unstable slopes)
- Erosion potential

4.8 Hazards and Hazardous Materials

Construction of the expanded reservoir would involve the use of hazardous materials that could pose an environmental threat if accidentally released. In addition, earthwork activities, such as pipeline trenching, could encounter hazardous waste materials that require proper removal and disposal. Finally, the dam safety will also be evaluated. Potential effects to be evaluated include:

- Potential to encounter hazardous materials or waste during construction or potential to release hazardous materials during construction
- Potential to accidentally release chemicals during facility operations or cause changes with respect to the risk of upset
- Potential to expose people or structures to a significant risk of loss or injury involving flooding, including flooding as a result of the failure of a levee or dam.

4.9 Hydrology and Water Quality

The proposed reservoir expansion project has been designed to avoid significant impacts to other beneficial Delta water uses including other Delta water diverters. The EIS/EIR will evaluate the effects of proposed changes in the timing and/or amount of Delta diversions. Construction activities could cause short-term, temporary effects on local streams and drainages. Potential effects to be evaluated include:

- Changes in surface water flows and water levels and resulting adverse effects on beneficial uses (including instream uses such as aquatic habitat and fisheries, and recreation and consumptive uses)
- Changes in surface water quality from program operation or construction activities
- Alteration of existing drainage patterns
- Exposure of people to and/or increasing risk of flooding, seiche, or tsunami hazards

4.10 Land Use

Most of the proposed facility improvements or additions would occur within existing facility sites and rights-of-way, and the project is expected to be consistent with applicable land use plans, policies, and regulations. Potential effects to be evaluated include:

- Substantial conflict with any applicable land use plans, policies, and/or regulations of an agency with jurisdiction over the project, adopted for the purpose of avoiding or mitigating an environmental effect

- Disruption of an established community
- Conflict with any applicable habitat conservation plan or natural community conservation plan

4.11 Noise and Vibration

Noise and vibration effects from implementation of the project would largely be associated with facility construction activities and, as such, would be temporary and short term. The EIS/EIR will also evaluate potential changes in system operation that could result in long-term noise effects affecting adjacent land uses. Potential effects to be evaluated include:

- Construction noise and vibration
- Effects of operations on noise levels

4.12 Recreation

Construction of the expanded reservoir and associated facilities would result in short-term disruption of recreational activities primarily within CCWD's Los Vaqueros watershed and in the relocation of some watershed recreational facilities, such as the marina and some trails. The project has been designed to fully restore and enhance the recreational opportunities provided within the Los Vaqueros watershed. In addition, construction of additional intake facilities in the Delta may have short-term impacts on boating in the immediate vicinity of the construction site. Potential effects to be evaluated include:

- Effects on water-based recreational facilities and activities
- Effects on land-based recreational facilities and activities due to the siting or operations of proposed facilities or construction activities (e.g., short-term effects due to noise, dust, access restrictions)

4.13 Transportation and Circulation

Effects on traffic, transportation, and circulation resulting from the project would largely be associated with facility construction activities and, as such, would be temporary and short term. Construction activity would increase car, truck, and equipment traffic in the project area and could also result in temporary road restrictions and closures where Project facilities need to be installed within traffic lanes or rights-of-way. No long-term effects on traffic and circulation are expected. Potential effects to be evaluated include:

- Effects on the regional transportation network or facilities
- Effects of adding new vehicle trips and contributing to increased traffic congestion during construction and/or operation of proposed facilities
- Effects on traffic safety

4.14 Utilities and Public Services

The construction of the project facilities could encounter utility systems including electric power distribution lines, gas transmission pipelines, and wind power generation systems. The project would not result in a long-term change in public service or facilities needs. Potential effects to be evaluated include:

- Disruption of services (such as water or power) during construction
- Effects on other utilities (such as the need for relocation)
- Need for additional services during construction (such as increased police and/or private security services for site security and traffic control)
- Need for additional services for project operation, specifically power service requirements.

4.15 Growth-Inducing and Cumulative Effects

The potential for the project alternatives to remove an obstacle to future population growth and development will be evaluated in the EIS/EIR. To the extent that the project has growth-inducement potential, the EIR will evaluate the secondary effects of growth in accordance with CEQA requirements.

Potential cumulative effects will also be evaluated in relation to the effects of the project in light of other past, present, and reasonably foreseeable future projects that may act in combination with expanding Los Vaqueros Reservoir to produce effects that are cumulatively significant.

5.0 Mitigation Measures

Measures available to offset, avoid, reduce, or otherwise minimize the severity of potential impacts will be identified and discussed in the EIS/EIR. These measures will include those that can be employed during construction to reduce the effects of temporary construction activities and may include the acquisition of habitat capable of supporting special-status species to offset the loss of those lands inundated by the expanded reservoir.

6.0 Topics Eliminated from Discussion in the EIS/EIR

Based on the results of studies performed to date, no environmental topics will be excluded from discussion in the EIS/EIR.

Appendix B-2
Notice of Preparation Mailing List

ESA

Formal Notification	Interested Parties	Source: CP List	Source: CCWD AIP - NOP Mailing	Last Name	First Name	Title	Organization Name	Address	City	State	Postal Code
X				Sorenson	James	Director	Alameda County Community Development Agency	224 West Winton Ave, Room 110	Hayward	CA	94544
X				LaBelle	Donald	Director	Alameda County Public Works Agency	399 Elmhurst Street	Hayward	CA	94544
	X	X		Cartwright	Eric		Alameda County Water District	P.O. Box 5110	Fremont	CA	94537
	X	X		Sandkulla	Nicole		Bay Area Water Supply & Conservation Agency	155 Bovet Road, Suite 302	San Mateo	CA	94402
	X		X	Eckart	Bob	Environmental Affairs	Bureau of Reclamation	2800 Cottage Way	Sacramento	CA	95825
	X		X	Kegel	Erika		Bureau of Reclamation	2800 Cottage Way	Sacramento	CA	95825
	X	X		Roberson	Patricia		Bureau of Reclamation	2800 Cottage Way	Sacramento	CA	95825
	X		X	Gilmore	Rick	General Manager	Byron Bethany Irrigation District	P.O. Box 160	Byron	CA	94514
	X	X		Darling	Cindy		CA Bay-Delta Authority	650 Capitol Mall, 5th Floor	Sacramento	CA	95814
	X	X		O'Bryant	Dennis		CA Department of Conservation	801 "K" Street, MS 13-71	Sacramento	CA	95814
	X	X		Holmes	Anna		CA Department of Fish and Game	4001 N. Wilson Way	Stockton	CA	95205
	X	X		Starr	James		CA Department of Fish and Game	4001 N. Wilson Way	Stockton	CA	95205
	X	X		White	Jim		CA Department of Fish and Game	1416 Ninth Street	Sacramento	CA	95814
X			X	Floerke	Rob	Regional Manager, Central Coast Region	CA Department of Fish and Game	P.O. Box 47	Yountville	CA	94599
X				Morey	Sandy	Regional Manager, Sacramento Valley Sierra Region	CA Department of Fish and Game	1701 Nimbus Road	Rancho Cordova	CA	95670
	X		X	Healey	Mike		CA Department of Fish and Game	1701 Nimbus Road, Suite A	Rancho Cordova	CA	95670
	X			Dumas	Tom	Chief, Office of Intermodal Planning	CA Department of Transportation	P.O. Box 2048	Stockton	CA	95201
	X			Sable	Timothy	District Branch Chief	CA Department of Transportation	111 Grand Avenue, P.O. Box 23680	Oakland	CA	94623
	X	X		Cimperman	Stephen		CA Department of Water Resources	P.O. Box 942836	Sacramento	CA	95814
X			X	Kelly	Kathy		CA Department of Water Resources	P.O. Box 942836	Sacramento	CA	94236
	X	X		Roberts	Steve		CA Department of Water Resources	P.O. Box 942836	Sacramento	CA	95814
	X	X		Vogelsang	Chuck		CA Department of Water Resources	P.O. Box 942836	Sacramento	CA	94236
X			X	Sanders	Dwight	Division Chief, Environmental Planning	CA State Lands Commission	100 Howe Ave Suite 100 South	Sacramento	CA	95825
	X	X	X	Farrell	Anne		Central Contra Costa Sanitary District	5019 Imhoff Place	Martinez	CA	94553
	X		X	Nomellini, Sr.	Dante	General Manager and Co-Counsel	Central Delta Water Agency Nomellini, Grilli & McD	235 E. Weber Ave., P.O. Box 1461	Stockton	CA	95201
	X	X		Birk	Serge		Central Valley Project Water Association	11861 Parey Road	Red Bluff	CA	96080
	X	X		Stackhouse	Robert		Central Valley Project Water Association	1521 "I" Street	Sacramento	CA	95814
X			X	Landau	Ken	Assistant Executive Officer	Central Valley Region Water Quality Control Board (CVRWQCB)	11020 Sun Center Drive #200	Rancho Cordova	CA	95670
X				Pinkos	Thomas	Executive Officer	Central Valley Regional Water Quality Control Boa	11020 Sun Center Drive # 200	Rancho Cordova	CA	95670-6114
	X	X		Harrington	Phil	Director of Public Works	City of Antioch	P.O. Box 5007	Antioch	CA	94509
	X		X	Carniglia	Victor	Deputy Director	City of Antioch Planning Department	P.O. Box 5007	Antioch	CA	94531
	X	X		Eldredge	Paul		City of Brentwood	708 Third Street	Brentwood	CA	94513
	X		X	Leana	Mike	Planning Department	City of Brentwood Planning Department	708 Third Street	Brentwood	CA	94513
	X		X	Graves	Jeremy	Director	City of Clayton Planning Department	6000 Heritage Trail	Clayton	CA	94517
	X		X	Forsberg	Jim	Director of Planning & Economic Development	City of Concord Planning Department	1950 Parkside Drive	Concord	CA	94519
	X		X	Pearson	Richard	Deputy Director	City of Martinez Planning Department	525 Henrietta Street	Martinez	CA	94553
	X		X	Willis	Rebecca	Director	City of Oakley Planning Department	3639 Main Street	Oakley	CA	94561
				Fuller	John	Director	City of Pittsburg Pubic Works Department	65 Civic Avenue	Pittsburg	CA	94565
	X		X	Jerome	Randy		City of Pittsburg Planning Department	65 Civic Avenue	Pittsburg	CA	94565
	X		X	McCann	Casey	Deputy Director	City of Pleasant Hill Planning Department	100 Gregory Lane	Pleasant Hill	CA	94523

	X		X	Meyer	Sandra	Planning Manager	City of Walnut Creek Planning Department	1666 No. Main Street	Walnut Creek	CA	94596
X			X	Barry	Dennis	Community Development Director	Contra Costa County	651 Pine Street, 4th Floor - North Wing	Martinez	CA	94553
	X	X		Goulart	Roberta		Contra Costa County Community Development De	651 Pine St., 4th Floor, North Wing	Martinez	CA	94553
X				Shiu	Maurice	Director	Contra Costa County Public Works Department	255 Glacier Drive	Martinez	CA	94553
	X	X	X	Darling	Gary	General Manager	Delta Diablo Sanitation District	2500 Pittsburg-Antioch Highway	Antioch	CA	94509-1373
X			X	Fiack	Linda	Executive Director	Delta Protection Commission	14215 River Road	Walnut Grove	CA	95690
	X		X	Yeraka	Mike	General Manager	Diablo Water District	2107 Main Street	Oakley	CA	94561
	X	X		Campbell	Brian		East Bay Municipal Utility District	375 11th Street	Oakland	CA	94607
	X	X		O'Brien	Pat	General Manager	East Bay Regional Park District	P.O. Box 5381	Oakland	CA	94605
	X	X		Preston	Larry	General Manager	East Contra Costa Irrigation District	P.O. Box 696	Brentwood	CA	94513
	X		X	Leonard	Dick	Superintendent	Golden State Water Company	53-B Manor Drive	Bay Point	CA	94565
	X	X	X	Williams	Tom	District Manager	Ironhouse Sanitary District	450 Walnut Meadows Drive	Oakley	CA	94561
	X		X	Neudeck	Christopher		Kjeldson Sinnock Neudeck	P.O. Box 844	Stockton	CA	95201
	X	X		Oppenheim	Bruce		National Marine Fisheries Service	650 Capitol Mall, Suite 8-300	Sacramento	CA	95814
	X		X	Aceituno	Michael		National Marine Fisheries Service	650 Capitol Mall, Suite 6070	Sacramento	CA	95814
	X	X		Windham	Diane	Recovery Coordinator	National Marine Fisheries Service	650 Capitol Mall, Suite 8300	Sacramento	CA	95814
	X		X	Conway	Jeff		Reclamation District 800	P.O. Box 262	Discovery Bay	CA	94514
X				Chrisman	Mike	Secretary for Resources	Resources Agency	1416 Ninth Street	Sacramento	CA	95814
	X	X		Levin	Ellen		San Francisco Public Utilities Commission	1155 Market St., 4th Floor	San Francisco	CA	94103
	X		X	Sullivan	Kerry	Community Development Director	San Joaquin County	1810 East Hazelton Avenue	Stockton	CA	95205
	X	X		Kao	Cindy		Santa Clara Valley Water District	5750 Almaden Expressway	San Jose	CA	95118
	X	X		Maher	Joan		Santa Clara Valley Water District	5750 Almaden Expressway	San Jose	CA	95118
	X			Ligon	Tracy		Santa Clara Valley Water District	5750 Almaden Expressway	San Jose	CA	95118
	X		X	Herrick	John		South Delta Water Agency	4258 Pacific, Ste. 2	Stockton	CA	95207
X				Donaldson	Milford	State Historic Preservation Officer	State Historic Preservation Office	P.O. Box 942896	Sacramento	CA	94296-0001
X				Rabbon	Peter	General Manager	State Reclamation Board	P.O. Box 942836	Sacramento	CA	94236
X			X	Wilson	Greg	Division of Water Rights	State Water Resources Control Board	P.O. Box 2000	Sacramento	CA	95812
X				Wilson	Craig	Division of Water Quality	State Water Resources Control Board	P.O. Box 100	Sacramento	CA	95812
	X	X	X	Koehne	Virgil	General Manager	Town of Discovery Bay	1800 Willow Lake Road	Discovery Bay	CA	94514
	X		X	Guthrie	Bill		U.S. Army Corps of Engineers	1325 J Street	Sacramento	CA	95814-2922
	X	X	X	Finan	Michael		U.S. Army Corps of Engineers	1325 "J" Street	Sacramento	CA	95814
	X			Eldridge, Comm	Kevin	Rear Admiral	U.S. Coast Guard - 11th District	Commander PCP Building 42, Coast (	Alameda	CA	94501-5100
	X	X	X	Monroe	Michael		U.S. Environmental Protection Agency	75 Hawthorne Street	San Francisco	CA	94105
	X	X	X	Yale	Carolyn		U.S. Environmental Protection Agency	75 Hawthorne Street	San Francisco	CA	94105
	X	X	X	Bartoo	A. Leigh		U.S. Fish & Wildlife Service	2800 Cottage Way W-2605	Sacramento	CA	95825
	X	X		Littlefield	Mark Littlefield		U.S. Fish & Wildlife Service	2800 Cottage Way W-2605	Sacramento	CA	95825
	X		X	Guinee	Roger	Supervisor, Water Operations	U.S. Fish & Wildlife Service	2800 Cottage Way, Room W-2605	Sacramento	CA	95825
	X		X	Nichols	Graydon	Business Manager	Victoria Island Farms	P.O. Box 87	Holt	CA	95234
	X		X	Knight	Russel		Western Area Power Administration	114 Parkshore Drive	Folsom	CA	95630
	X	X		Wong	Vincent		Zone 7 Water Agency	5997 Parkside Drive	Pleasanton	CA	94588

Appendix B-3
Office of Planning and Research Filing Acknowledgement

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P. O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH # ______

RECEIVED
JAN 10 2006
STATE CLEARING HOUSE

Project Title: Los Vaqueros Reservoir Expansion Project
Lead Agency: Contra Costa Water District
Contact Person: Marguerite Naillon
Mailing Address: P.O. Box H20
Phone: (925) 688-8018
City: Concord, CA
Zip: 94524-2099
County: Contra Costa

Project Location:
County: Contra Costa and Alameda County(s)
City/Nearest Community: Brentwood, Byron
Cross Streets: Multiple Steets
Zip Code: 94513, 94514
Assessor's Parcel No.: Multiple Parcels
Section: ______ Twp.: 02S, 03S Range: 02E, 03E Base: M.D.B. & M.
Within 2 Miles: State Hwy #: 4
Waterways: Sacramento-San Joaquin Delta, Kellogg Creek
Airports: Bryon Airport
Railways: ______
Schools: ______

Document Type:

CEQA: ☒ NOP ☐ Early Cons ☐ Neg Dec ☐ Mit Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent EIR (Prior SCH No.)______ ☐ Other ______

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other______

Local Action Type:

☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan ☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan ☐ Rezone ☐ Prezone ☐ Use Permit ☐ Land Division (Subdivision, etc.) ☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☒ Other Reservoir and related facilities

Development Type:

☐ Residential: Units______ Acres______
☐ Office: Sq.ft.______ Acres______ Employees______
☐ Commercial: Sq.ft.______ Acres______ Employees______
☐ Industrial: Sq.ft.______ Acres______ Employees______
☐ Educational ______
☐ Recreational ______
Total Acres (approx.)______

☒ Water Facilities: Type Storage Reservoir/Pipelines/Pumps MGD Up to 500 TAF
☐ Transportation: Type______
☐ Mining: Mineral______
☐ Power: Type______ MW______
☐ Waste Treatment: Type______ MGD______
☐ Hazardous Waste: Type______
☐ Other:______

Project Issues Discussed in Document:

☒ Aesthetic/Visual
☒ Agricultural Land
☒ Air Quality
☒ Archeological/Historical
☒ Biological Resources
☐ Coastal Zone
☒ Drainage/Absorption
☒ Economic/Jobs
☐ Fiscal
☒ Flood Plain/Flooding
☐ Forest Land/Fire Hazard
☒ Geologic/Seismic
☒ Minerals
☒ Noise
☐ Population/Housing Balance
☒ Public Services/Facilities
☒ Recreation/Parks
☐ Schools/Universities
☐ Septic Systems
☐ Sewer Capacity
☒ Soil Erosion/Compaction/Grading
☐ Solid Waste
☒ Toxic/Hazardous
☒ Traffic/Circulation
☒ Vegetation
☒ Water Quality
☒ Water Supply/Groundwater
☒ Wetland/Riparian
☒ Wildlife
☒ Growth Inducing
☒ Land Use
☒ Cumulative Effects
☐ Other ______

Present Land Use/Zoning/General Plan Designation:

Multiple land use designations inluding agriculture and open space

Project Description: *(please use a separate page if necessary)*

Construct and operate an expanded Los Vaqueros Reservoir with a storage capacity of up to 500 thousand acre-feet, associated intake, pump stations, pipelines, and related facilities suitable to develop replacement water supplies for a fisheries protection program such as the long-term Environmental Water Account (EWA) program or an equivalent program, increase water supply reliability for water providers within portions of the San Francisco Bay Area, and to the extent possible through the pursuit of the water supply reliability and environmental water objectives, improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area study area.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2004

Appendix C

Public Notice and Meeting Advertisement

Appendix C-1

Reclamation Press Release

Mid-Pacific Region
Sacramento, CA

MP-06-???

Media Contact: Jeffrey McCracken 916-978-5100
jmccracken@mp.usbr.gov

For Release On: January 5, 2006

Public Scoping Meetings Scheduled on the Los Vaqueros Reservoir Expansion Investigation

The Bureau of Reclamation, along with the Contra Costa Water District, will prepare an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Los Vaqueros Reservoir Expansion Investigation. A Notice of Intent (NOI) to prepare the EIS was published in the Federal Register on Tuesday, December 20, 2005.

Four public scoping meetings are being held to solicit public input on topics to be addressed in the EIS/EIR, including resources to be evaluated, alternatives to be considered, and significant concerns and issues. The meetings will begin with a 45-minute open house during which participants will have the opportunity to interact directly with the study team, followed by a brief presentation by the lead agencies. The second hour of the scoping meetings will consist of a facilitated comment period. The meetings are scheduled as follows:

- Tuesday, January 24, 2006, 1:30 to 3:30 p.m., Department of Water Resources, the Bonderson Building, 901 P Street, Public Hearing Room first floor, Sacramento, CA 95814
- Tuesday, January 24, 2006, 6 to 8 p.m. Legion Hall, Veteran's Memorial building 403 West 6th Street, Antioch, CA 94509
- Wednesday January 25, 2006, 6 to 8 p.m., Martinelli Event Center, Agricultural Center, 3585 Greenville Road, Livermore, CA 94550
- Thursday, January 26, 2006, 6 to 8 p.m., Contra Costa Water District, 1331 Concord Ave., Concord, CA 94520

The EIS/EIR will evaluate expanding the existing Los Vaqueros Reservoir and alternatives to improve water supply reliability and water quality for Bay Area water users, particularly those receiving water from the Sacramento-San Joaquin Delta; and contribute to lower cost implementation of the Environmental Water Account. Contra Costa Water District is the lead agency for preparation of the EIR.

Written comments on the scope of the environmental document are due by close of business February 28, 2006, and should be sent to Ms. Patricia Roberson, Bureau of Reclamation, 2800 Cottage Way, Sacramento CA 95825-1898. For additional information, please contact Ms. Roberson at 916-978-5094, TDD 916-978-5608, or e-mail proberson@mp.usbr.gov.

Appendix C-2

Reclamation/CCWD
Notification Flyer

Los Vaqueros Reservoir Expansion Project

Please join us for

PUBLIC SCOPING MEETINGS

U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

CONTRA COSTA WATER DISTRICT

Los Vaqueros Reservoir Expansion Project
EIS/EIR PUBLIC SCOPING MEETINGS

The Contra Costa Water District *(CCWD)* and Bureau of Reclamation *(Reclamation)* are currently evaluating if an expanded Los Vaqueros Reservoir could:

- Improve **water supply reliability** for Bay Area water users
- Improve **water quality** for Bay Area water users
- Provide lower cost water for the Environmental Water Account to **protect Delta fish species**

We are now in the environmental review phase. To meet Federal and State requirements, Reclamation and CCWD will prepare a joint Environmental Impact Statement / Environmental Impact Report *(EIS/EIR)* to evaluate alternatives to meet project purposes.

Please join us for public scoping meetings.

CCWD and Reclamation want to hear your input on topics to address in the EIS/EIR, including resources to be evaluated, alternatives to be considered, and significant concerns and issues. At each of the scoping meetings, participants will have an opportunity to:

- View updated project information in an **Open House** format and interact with the project team *(45 minutes)*
- Hear a **Brief Presentation** focused on project updates and schedule *(15 minutes)*
- Participate in a facilitated **Public Comment Period** *(60 minutes)*

Meetings will be held at the following locations:

Please note that the program for each meeting is identical.

SACRAMENTO
Tuesday, January 24, 2006
1:30 to 3:30 p.m.
Dept. of Water Resources
Bonderson Building
(Public Hearing Rm - 1st flr.)
901 P Street

ANTIOCH
Tuesday, January 24, 2006
6:00 to 8:00 p.m.
Veteran's Memorial
Building, Legion Hall
403 West 6th Street

LIVERMORE
Wednesday January 25, 2006
6:00 to 8:00 p.m.
Martinelli Event Center
Agricultural Center
3583 Greenville Road

CONCORD
Thursday, January 26, 2006
6:00 to 8:00 p.m.
Contra Costa Water District
1331 Concord Avenue

Written comments on the scope of the environmental document are due by close of business February 28, 2006. To submit written comments or if you have any other questions, please contact:

Marguerite Naillon
Contra Costa Water District
P.O. Box H20
Concord CA 94524
925 688-8018
FAX 925 686-2187
lvstudies@hotmail.com

OR

Patricia Roberson
Bureau of Reclamation
2800 Cottage Way
Sacramento CA 95825-1898
916 978-5074 FAX 916 978-5094
TDD 916 978-5608
proberson@mp.usbr.gov

Please visit our project websites at **www.lvstudies.com** or **www.usbr.gov/mp/vaqueros** to find project information including the Notice of Intent *(NOI)* and the Notice of Preparation *(NOP)*.

Appendix C-3
CCWD Newspaper Advertisement

Notice of Public Scoping Meetings
Los Vaqueros Reservoir Expansion EIS/EIR

The Contra Costa Water District (CCWD) and Bureau of Reclamation (Reclamation) are in the environmental review stage of evaluating the potential expansion of Los Vaqueros Reservoir from 100,000 acre-feet up to 500,000 acre-feet to provide lower cost water for the Environmental Water Account (a fisheries protection and restoration program) and improve water supply reliability and water quality for Bay Area water users. CCWD and Reclamation will host four public scoping meetings to hear input on topics to be addressed in the Environmental Impact Statement / Environmental Impact Report (EIS/EIR), including resources to be evaluated, alternatives to be considered, and significant concerns and issues. At each of the scoping meetings, participants will have an opportunity to: view updated project information in an **Open House** and interact with the project team, hear a **Brief Presentation** focused on project updates and schedule, and participate in a facilitated **Public Comment Period**.

The scoping meetings will be held at the following locations and times:

Sacramento, Tuesday, January 24, 2006, 1:30 – 3:30 p.m., Bonderson Building (Public Hearing Rm. – 1st floor) 901 P Street**,** Sacramento, CA 95814;

Antioch, Tuesday, January 24, 2006, 6:00 – 8:00 p.m.**,** Veteran's Memorial Building, Legion Hall**,** 403 West 6th Street**,** Antioch, CA 94509;

Livermore, Wednesday, January 25, 2006, 6:00 – 8:00 p.m.**,** Martinelli Event Center**,** Agricultural Center**,** 3585 Greenville Road**,** Livermore, CA 94550;

Concord, Thursday, January 26, 2006, 6:00 – 8:00 p.m.**,** Contra Costa Water District, Board Room, 1331 Concord Avenue**,** Concord, CA 94520.

We encourage you to attend one or more meetings! Please note that the program for each meeting is identical.

Visit our web sites at **www.lvstudies.com** and **www.usbr.gov/mp/vaqueros** for more information. CCWD facilities and meetings comply with the Americans with Disabilities Act. If special accommodations are needed for you to participate, please contact the Project Manager as soon as possible, but preferably at least two days prior to the meeting.

Questions? Please contact Marguerite Naillon, CCWD Project Manager at (925) 688-8018 / lvstudies@hotmail.com.

Appendix C-4

CCWD Letter to Elected Officials

ESA

January 4, 2006

Name
Address
City, State Zip Code

Subject: Los Vaqueros Reservoir Expansion Studies Public Scoping Meetings

Dear :

In 2004, the voters of the Contra Costa Water District (CCWD) approved the District proceeding with studies to expand Los Vaqueros Reservoir by a vote of 62% to 38%. CCWD is coordinating with the U.S. Bureau of Reclamation (Reclamation) to prepare an Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) on the potential expansion of the Los Vaqueros Reservoir. Expansion of Los Vaqueros Reservoir is one of the potential surface storage projects described in the CALFED Bay-Delta Program's long-term plan that could contribute to improving the quality and reliability of Bay Area drinking water supplies and Delta ecosystems. Over the last four years, CCWD has completed a series of environmental and operational studies on an expansion, while keeping the public and stakeholders informed through a comprehensive outreach program. CCWD and Reclamation are now entering the next environmental review phase and have scheduled a series of public scoping meetings.

The purpose of the scoping meetings is to bring people up to date on the Studies, including upcoming reports for the environmental review. The meetings are also an opportunity to gather formal public scoping comments on the potential environmental impacts of the project. The scoping meetings will be January 24, 25, and 26, 2006, at the four locations shown below. The meetings will begin with an open house, during which participants will have the opportunity to view exhibits and interact directly with members of the project team. A brief presentation will follow with a formal public comment period.

Sacramento Tuesday, January 24, 2006 1:30 p.m. – 3:30 p.m. Bonderson Building, Public Hearing Rm. (first floor) 901 P Street Sacramento, CA 95814	**Antioch** Tuesday, January 24, 2006 6:00 p.m. – 8:00 p.m. Legion Hall, Veteran's Memorial Building 403 West 6th Street Antioch, CA 94509
Livermore Wednesday, January 25, 2006 6:00 p.m. – 8:00 p.m. Martinelli Event Center, Agricultural Center 3585 Greenville Road Livermore, CA 94550	**Concord** Thursday, January 26, 2006 6:00 p.m. – 8:00 p.m. Contra Costa Water District Center 1331 Concord Avenue Concord, CA 94520

All those interested are invited to provide comment on the scope of the environmental analysis. This public comment period will extend through February 28, 2006. Please join us to learn more about the Studies and provide your comments. If you have any questions, please contact Marguerite Naillon, Project Manager at (925) 688-8018 or mnaillon@ccwater.com. Please visit the project website for project information updates at www.lvstudies.com. CCWD will keep you informed on the progress of the EIS/EIR.

Sincerely,

Joseph L. Campbell
President

JLC/MN:ps

CONTRA COSTA
WATER DISTRICT

1331 Concord Avenue
P.O. Box H20
Concord, CA 94524
(925) 688-8000 FAX (925) 688-8122

January 5, 2006

The Honorable Federal Glover
Supervisor/Dist 5
Contra Costa County
315 E. Leland Road
Pittsburg, CA 94565

Subject: Los Vaqueros Reservoir Expansion Studies Public Scoping Meetings

Dear Supervisor ~~Glover:~~ Federal -

In 2004, the voters of the Contra Costa Water District (CCWD) approved the District proceeding with studies to expand Los Vaqueros Reservoir by a vote of 62% to 38%. CCWD is coordinating with the U.S. Bureau of Reclamation (Reclamation) to prepare an Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) on the potential expansion of the Los Vaqueros Reservoir. Expansion of Los Vaqueros Reservoir is one of the potential surface storage projects described in the CALFED Bay-Delta Program's long-term plan that could contribute to improving the quality and reliability of Bay Area drinking water supplies and Delta ecosystems. Over the last four years, CCWD has completed a series of environmental and operational studies on an expansion, while keeping the public and stakeholders informed through a comprehensive outreach program. CCWD and Reclamation are now entering the next environmental review phase and have scheduled a series of public scoping meetings.

The purpose of the scoping meetings is to bring people up to date on the Studies, including upcoming reports for the environmental review. The meetings are also an opportunity to gather formal public scoping comments on the potential environmental impacts of the project. The scoping meetings will be January 24, 25, and 26, 2006, at the four locations shown below. The meetings will begin with an open house, during which participants will have the opportunity to view exhibits and interact directly with members of the project team. A brief presentation will follow with a formal public comment period.

Sacramento
Tuesday, January 24, 2006
1:30 p.m. – 3:30 p.m.
Bonderson Building, Public Hearing Rm.
(first floor)
901 P Street
Sacramento, CA 95814

Antioch
Tuesday, January 24, 2006
6:00 p.m. – 8:00 p.m.
Legion Hall, Veteran's Memorial Building
403 West 6th Street
Antioch, CA 94509

Livermore
Wednesday, January 25, 2006
6:00 p.m. – 8:00 p.m.
Martinelli Event Center, Agricultural Center
3585 Greenville Road
Livermore, CA 94550

Concord
Thursday, January 26, 2006
6:00 p.m. – 8:00 p.m.
Contra Costa Water District Center
1331 Concord Avenue
Concord, CA 94520

All those interested are invited to provide comment on the scope of the environmental analysis. This public comment period will extend through February 28, 2006. Please join us to learn more about the Studies and provide your comments. If you have any questions, please contact Marguerite Naillon, Project Manager at (925) 688-8018 or mnaillon@ccwater.com. Please visit the project website for project information updates at www.lvstudies.com. CCWD will keep you informed on the progress of the EIS/EIR.

Sincerely,

Joseph L. Campbell
President

JLC/MN:ps

Appendix D
Scoping Meeting Materials

Appendix D-1
Open House Program/Agenda

LOS VAQUEROS RESERVOIR EXPANSION EIS/EIR

PUBLIC SCOPING MEETINGS

PUBLIC SCOPING MEETINGS
Sacramento, Antioch, Livermore, and Concord, CA
January 24 -26, 2006

AGENDA

6:00 – 6:45 **Informational Open House**

6:45 – 7:00 **Presentation**
- Welcome / Meeting Purpose, *Charles Gardiner*
- Overview of Environmental Review (CEQA / NEPA), *Marguerite Naillon, CCWD & Patricia Roberson, Reclamation*
- Study Schedule – *Charles Gardiner*

7:00 – 8:00 **Public Comments**
- Facilitated Public Comment Period*

** Please submit a Speaker Card if you wish to provide oral comments at the meeting. A court reporter will be present to document your comments.*

Open House Program

General Project Overview/ Background

Station 1: Welcome & Sign-in

Welcome to the information open house and public meeting. Please sign-in and collect the meeting handouts.

Station 2: Regional Context

Review background information describing the Delta challenges, the storage program, and the Environmental Water Account.

Specific Project Information

Station 3: Project Overview/Purposes and Objectives

Review project purposes and local needs for each objective.

Station 4: Alternatives

Learn about alternatives development and evaluation.

Station 5: Environmental Issues

Learn about impacts in the immediate expansion area, impacts related to facility construction, and impacts to Delta operations.

Next Steps

Station 6: Study Process/Schedule

Learn about the environmental review process, feasibility report process, and overall schedule. Learn who to contact with comments and questions and where you can find additional information.

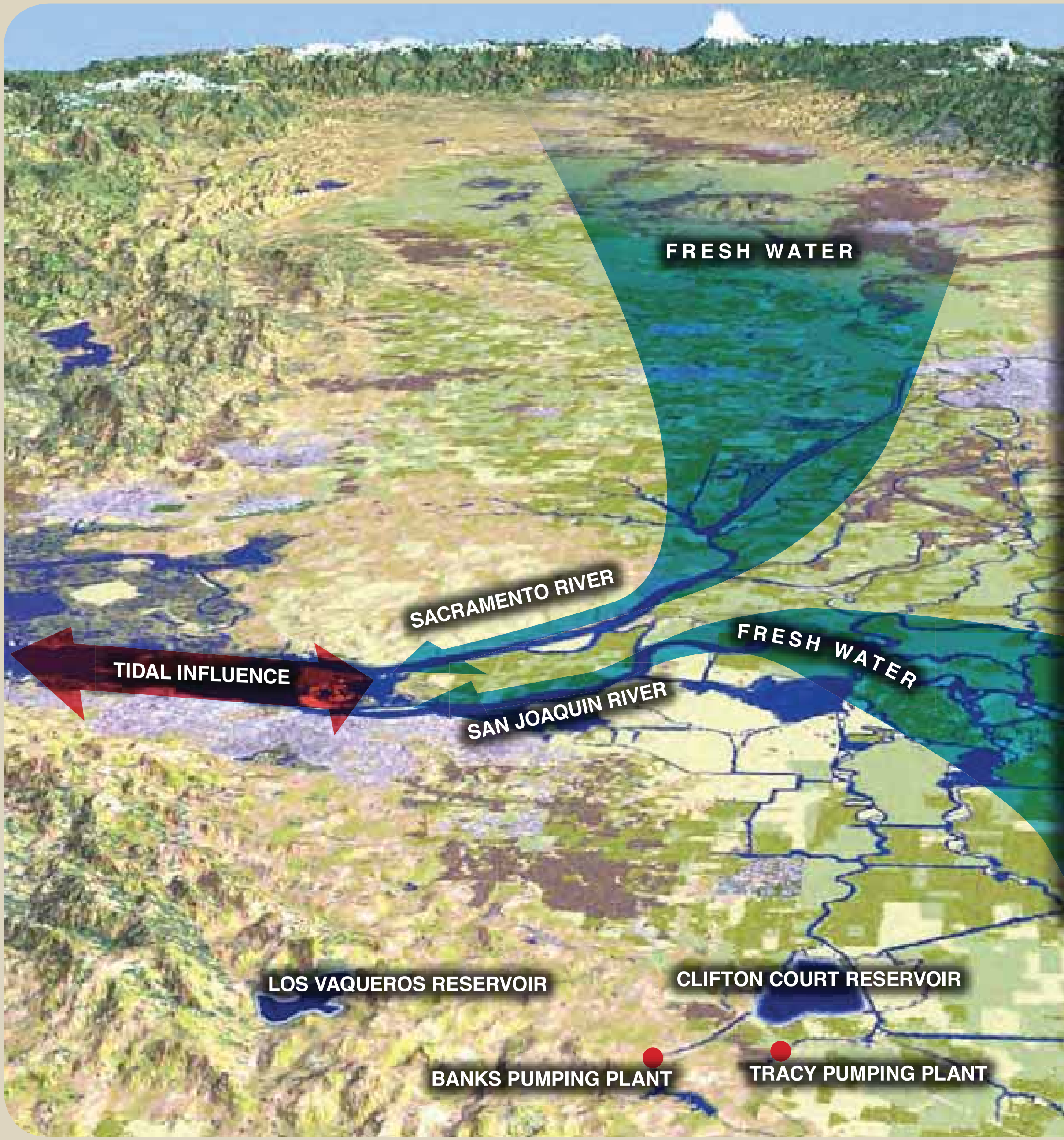
Appendix D-2

Open House Exhibit Boards

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRA COSTA WATER DISTRICT

OVERVIEW OF BAY-DELTA SYSTEM



Delta Challenges

The Sacramento – San Joaquin Delta supplies water to more than twenty-three million water users in California. At the same time, the Delta provides essential habitat for a diverse array of fish and wildlife. We currently face many challenges to maintain a balance between water use and the environment including:

Ecosystem Restoration

A variety of factors have contributed to the decline of fish species in the Delta including loss of habitat and increased demand on water resources from the Delta.

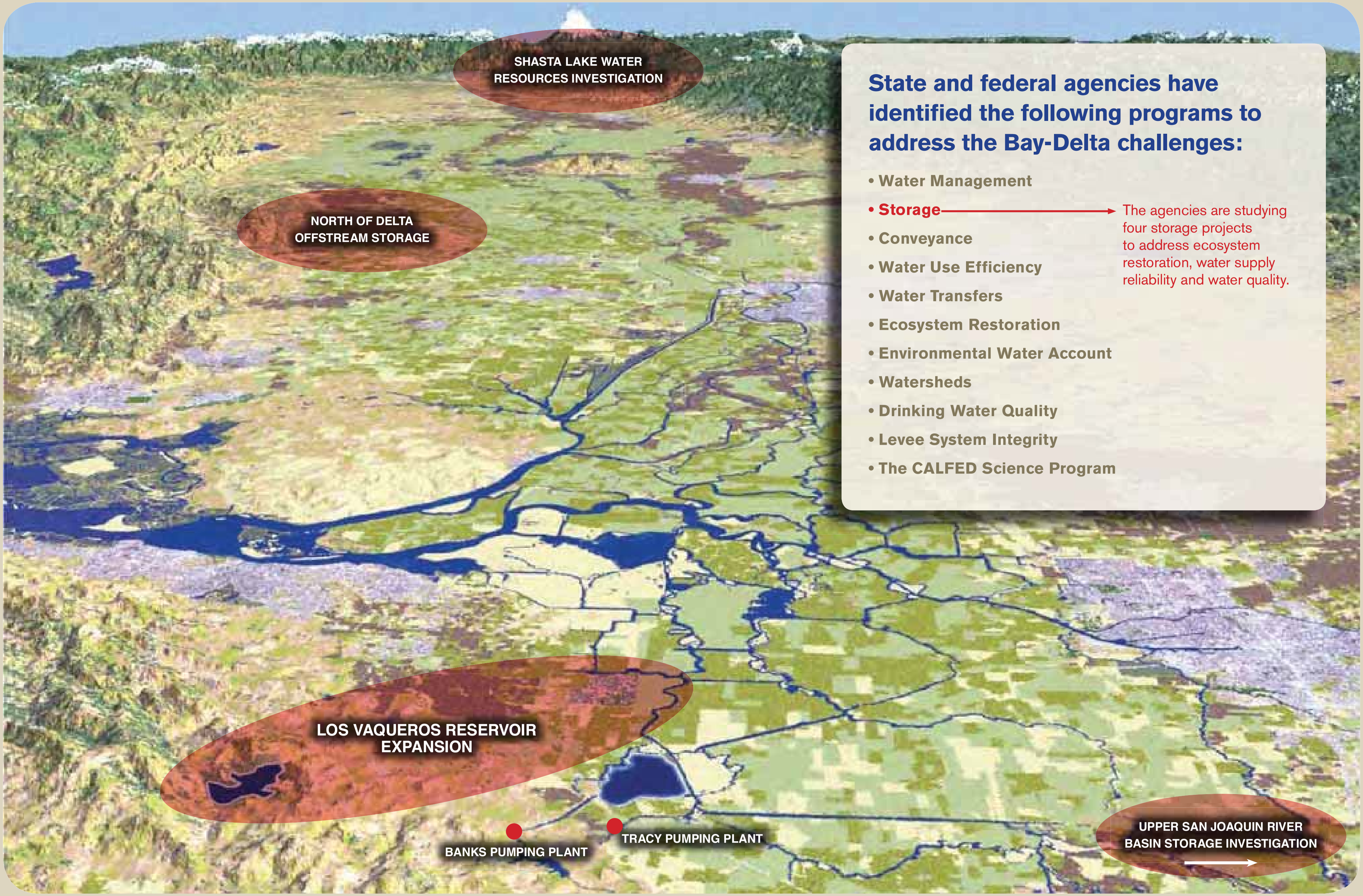
Water Quality

The quality of water from the Delta has generally declined due to salinity intrusion from the Bay, polluted runoff from urban, agricultural and other developments, increases in water demand, and changes to the physical environment.

Water Supply Reliability

Delivery of Delta water supplies decreases significantly during dry and critically dry years. Water agencies need to consider strategies to improve reliability to fill deficiencies during a drought or in an emergency such as a levee failure or spill in the Delta.

ONGOING STORAGE PROJECT STUDIES



State and federal agencies have identified the following programs to address the Bay-Delta challenges:

- Water Management
- **Storage** → The agencies are studying four storage projects to address ecosystem restoration, water supply reliability and water quality.
- Conveyance
- Water Use Efficiency
- Water Transfers
- Ecosystem Restoration
- Environmental Water Account
- Watersheds
- Drinking Water Quality
- Levee System Integrity
- The CALFED Science Program

Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

ENVIRONMENTAL WATER ACCOUNT

What is the Environmental Water Account?

The EWA contributes to the protection and recovery of at-risk native Delta-dependent fish species. EWA works by reducing pumping from the Delta when fish are most at risk and repaying that water to the state and federal water projects so users' water supplies are not reduced.

Two primary elements of the EWA include: acquiring and managing water assets; and using these assets to repay the water projects when actions are taken to protect Delta fish.

ASSETS

- Water Purchases
- Operational Flexibility

ACTIONS

- Pumping Curtailments
- In-Stream Flow Augmentation
- Delta Cross Channel Closures
- Delta Out-Flow Augmentation

AGENCIES

- Bureau of Reclamation
- Department of Water Resources
- National Marine Fisheries Service
- US Fish and Wildlife Service
- CA Department of Fish and Game

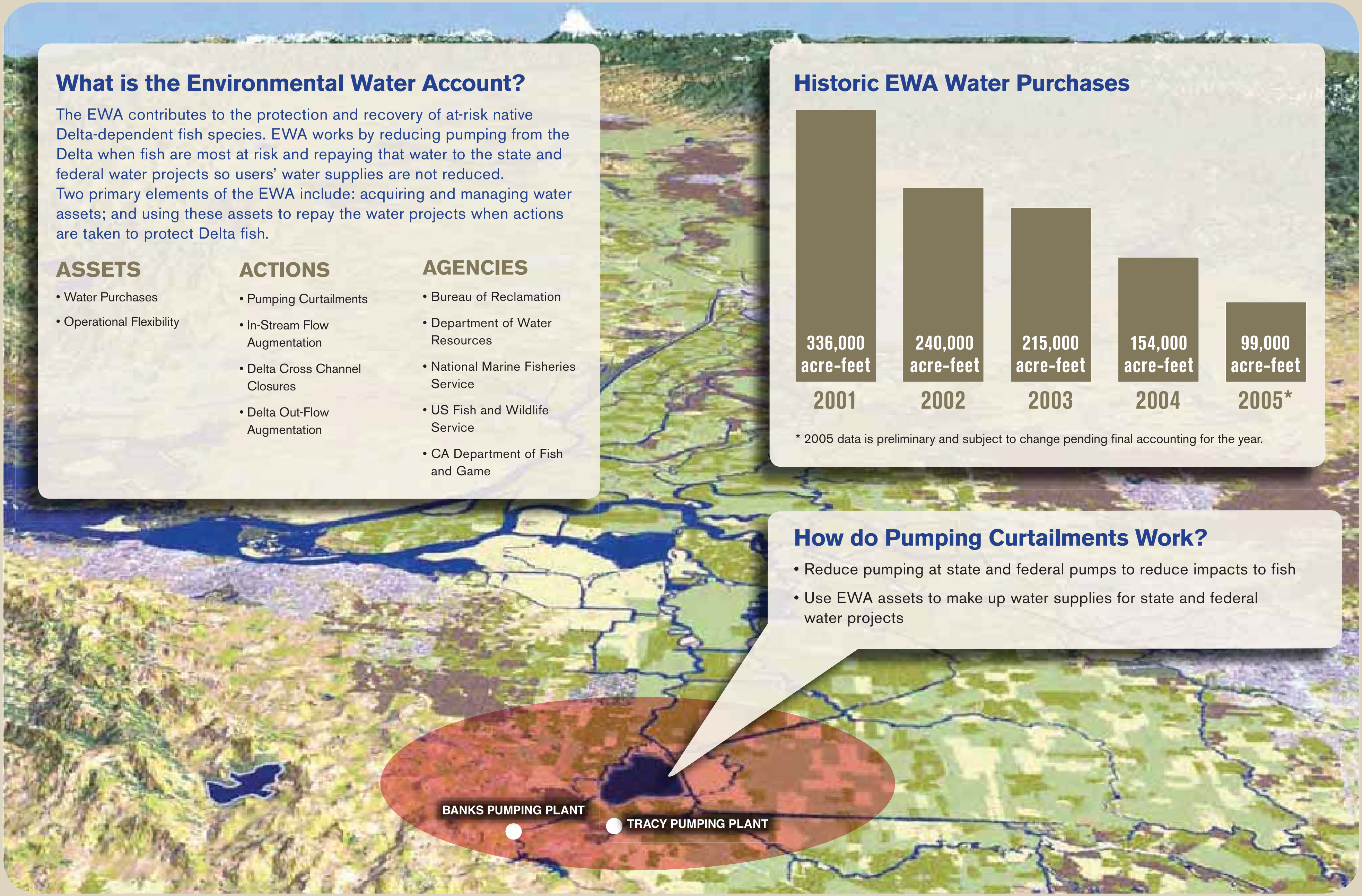
Historic EWA Water Purchases

2001	2002	2003	2004	2005*
336,000 acre-feet	240,000 acre-feet	215,000 acre-feet	154,000 acre-feet	99,000 acre-feet

* 2005 data is preliminary and subject to change pending final accounting for the year.

How do Pumping Curtailments Work?

- Reduce pumping at state and federal pumps to reduce impacts to fish
- Use EWA assets to make up water supplies for state and federal water projects



PROJECT PURPOSES

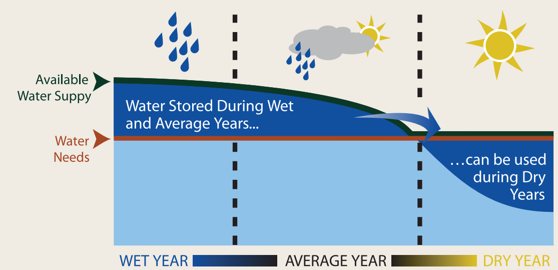
Districts that could be served by an expanded reservoir.

Environmental Water

Use an expanded Los Vaqueros Reservoir to develop replacement water supplies for a fisheries protection program such as the long-term Environmental Water Account (EWA) program or an equivalent program.

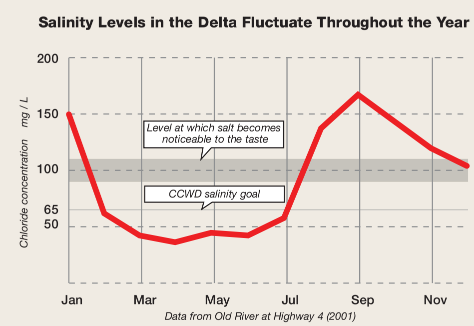
Water Supply Reliability

Increase water supply reliability for Bay Area water providers to help meet municipal and industrial water demands during drought periods.



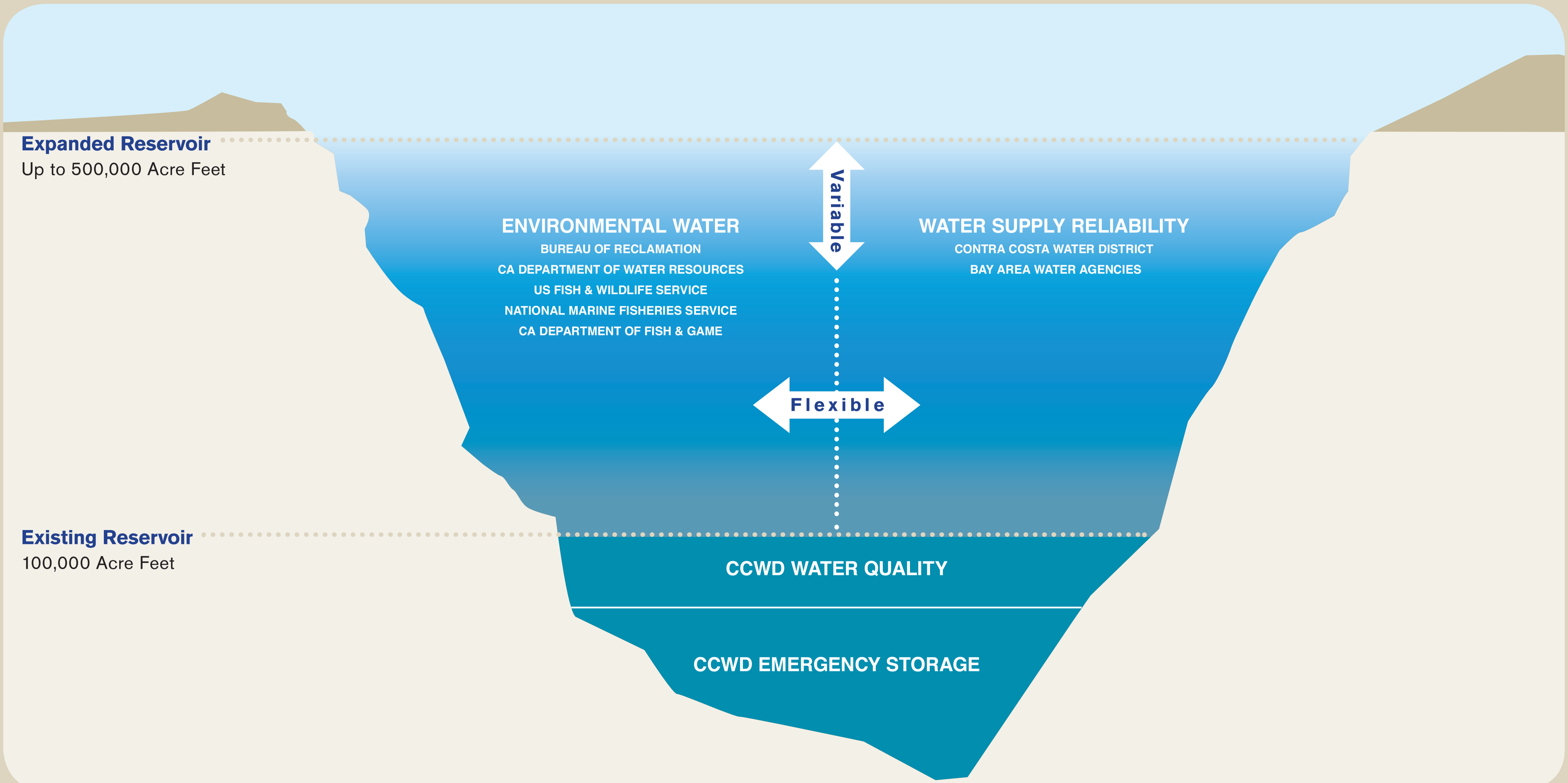
Water Quality

While meeting water supply reliability and environmental water objectives, improve the quality of water deliveries to municipal and industrial customers in the Bay Area.

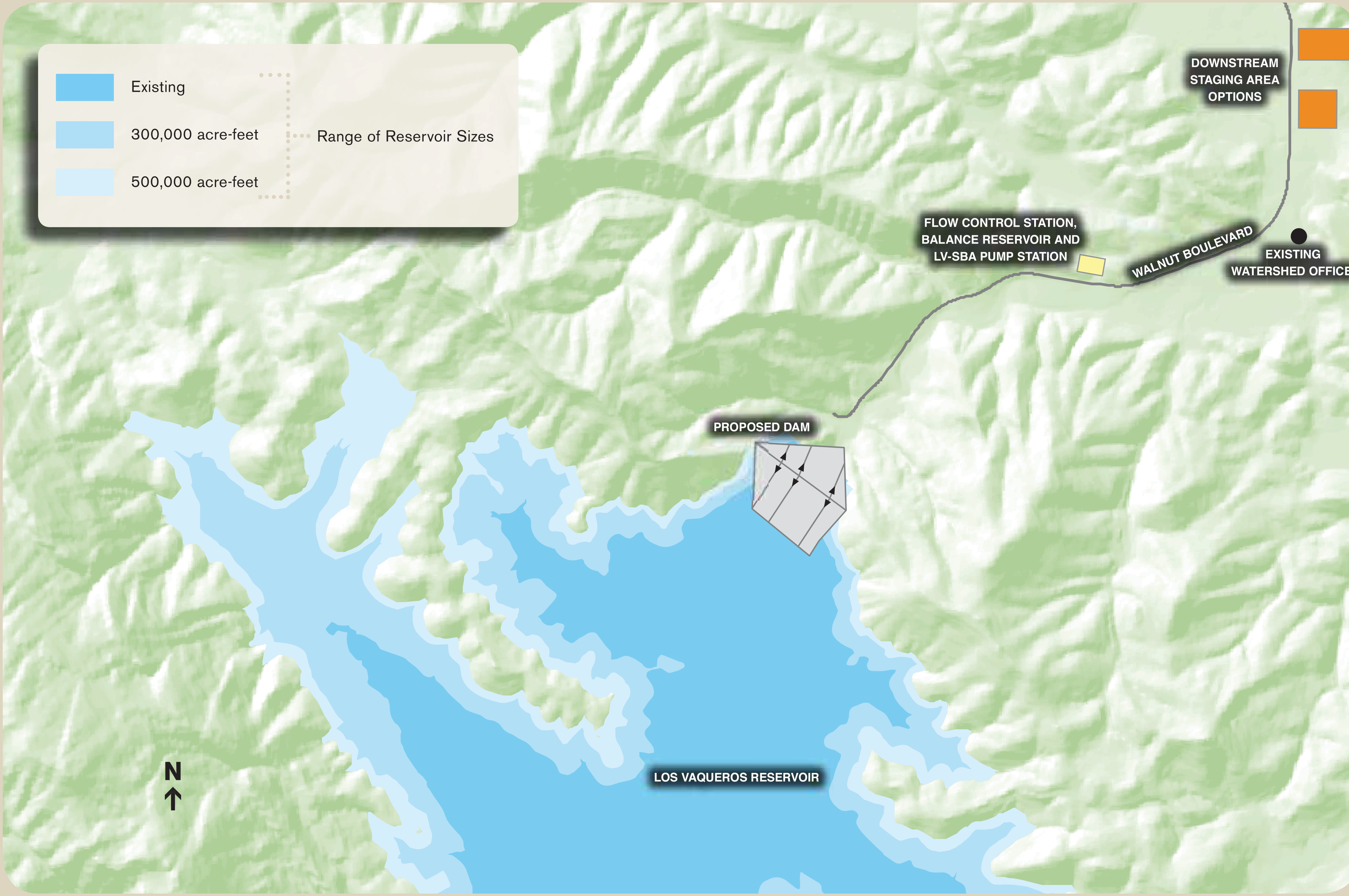


WATER USES

The water stored in an expanded Los Vaqueros Reservoir would be used for environmental water, water supply reliability and water quality. The level of participation by potential project partners will determine the uses of water from the reservoir.

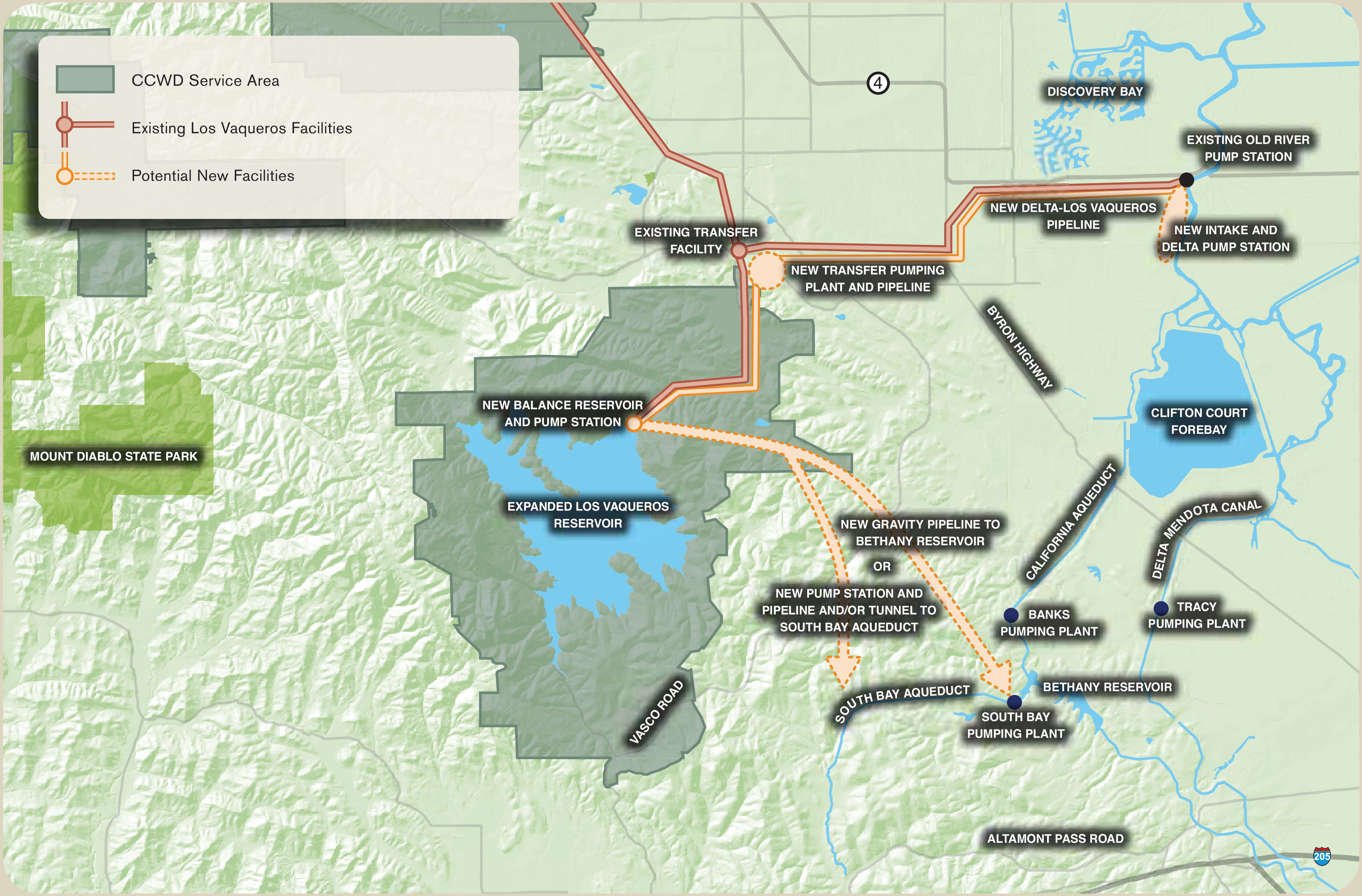


RESERVOIR FACILITIES



Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

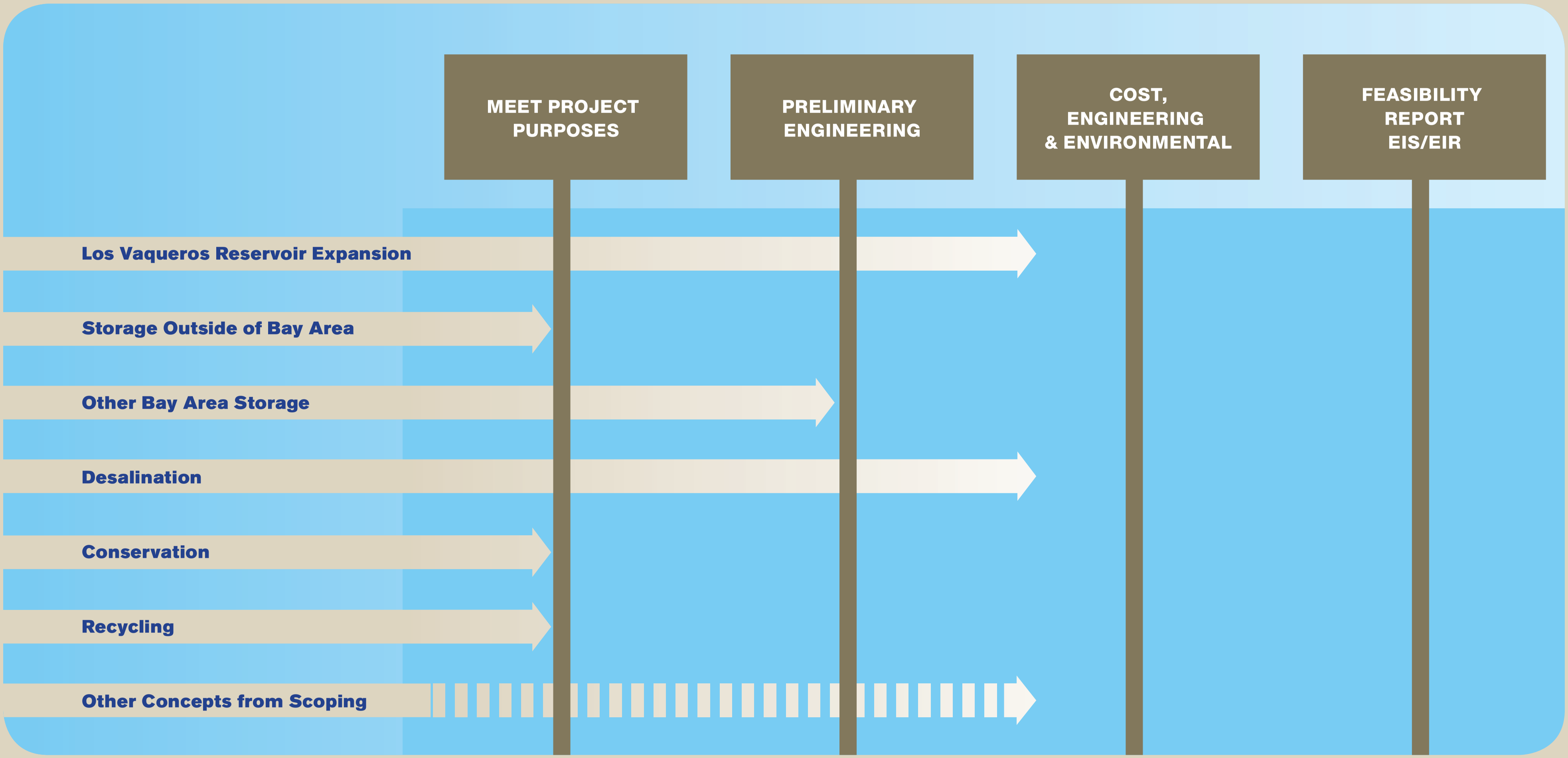
CONVEYANCE FACILITIES



Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

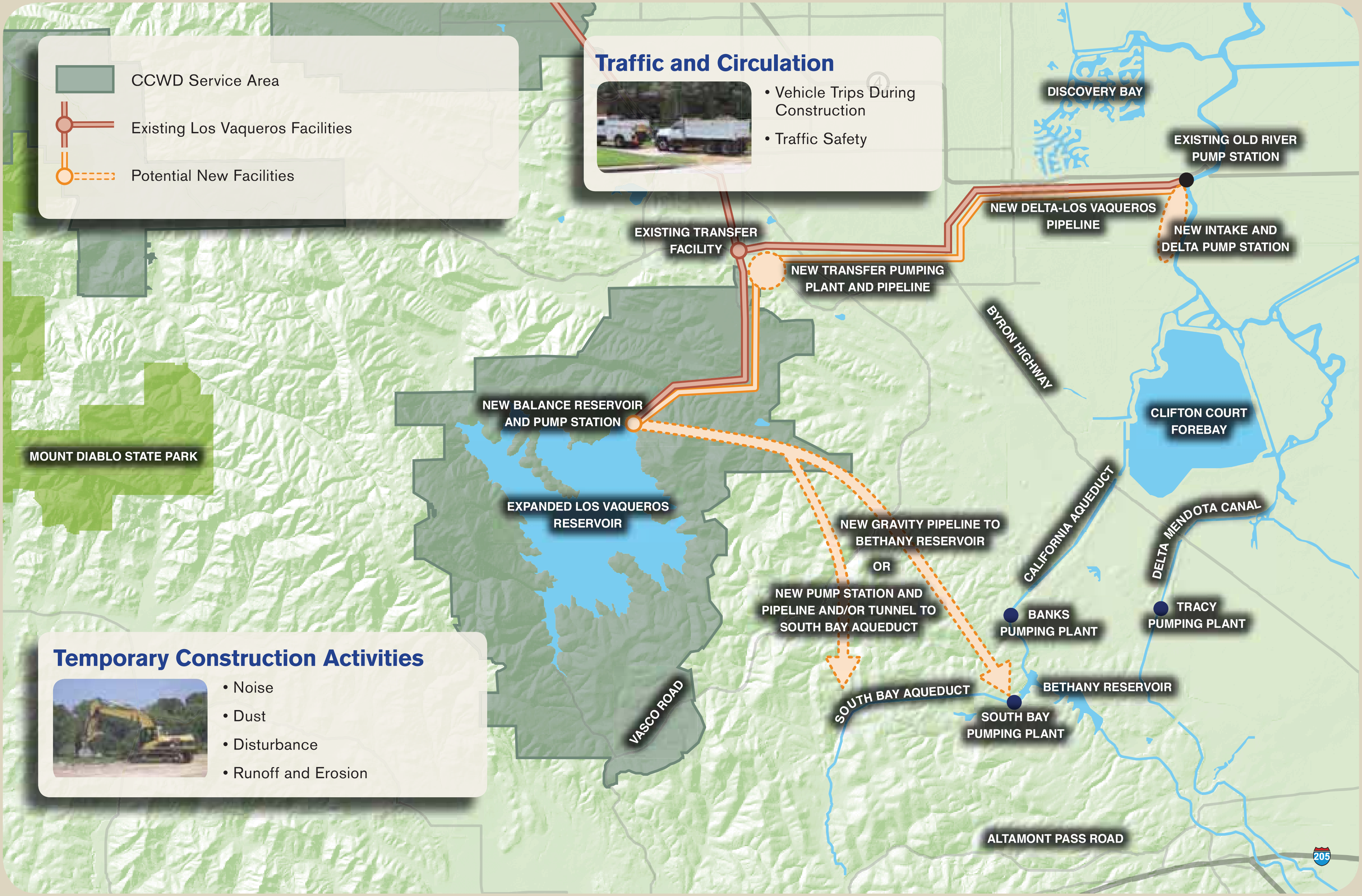
ALTERNATIVES DEVELOPMENT

The agencies are developing and refining alternatives.



ENVIRONMENTAL ISSUES - INUNDATION

ENVIRONMENTAL ISSUES - FACILITY CONSTRUCTION



Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

ENVIRONMENTAL ISSUES - OPERATIONS

Cumulative and Growth Inducing Effects

Effects of project within water service area:

- Considering past, present and reasonably foreseeable future projects
- Secondary effects of growth

Delta Fisheries

- Effects on at-risk fish populations from diversions
- Effects on at-risk fish habitat (water quality and water levels, flows and circulation)
- Cumulative effect on fish in combination with other Delta diversions

Delta Water Quality

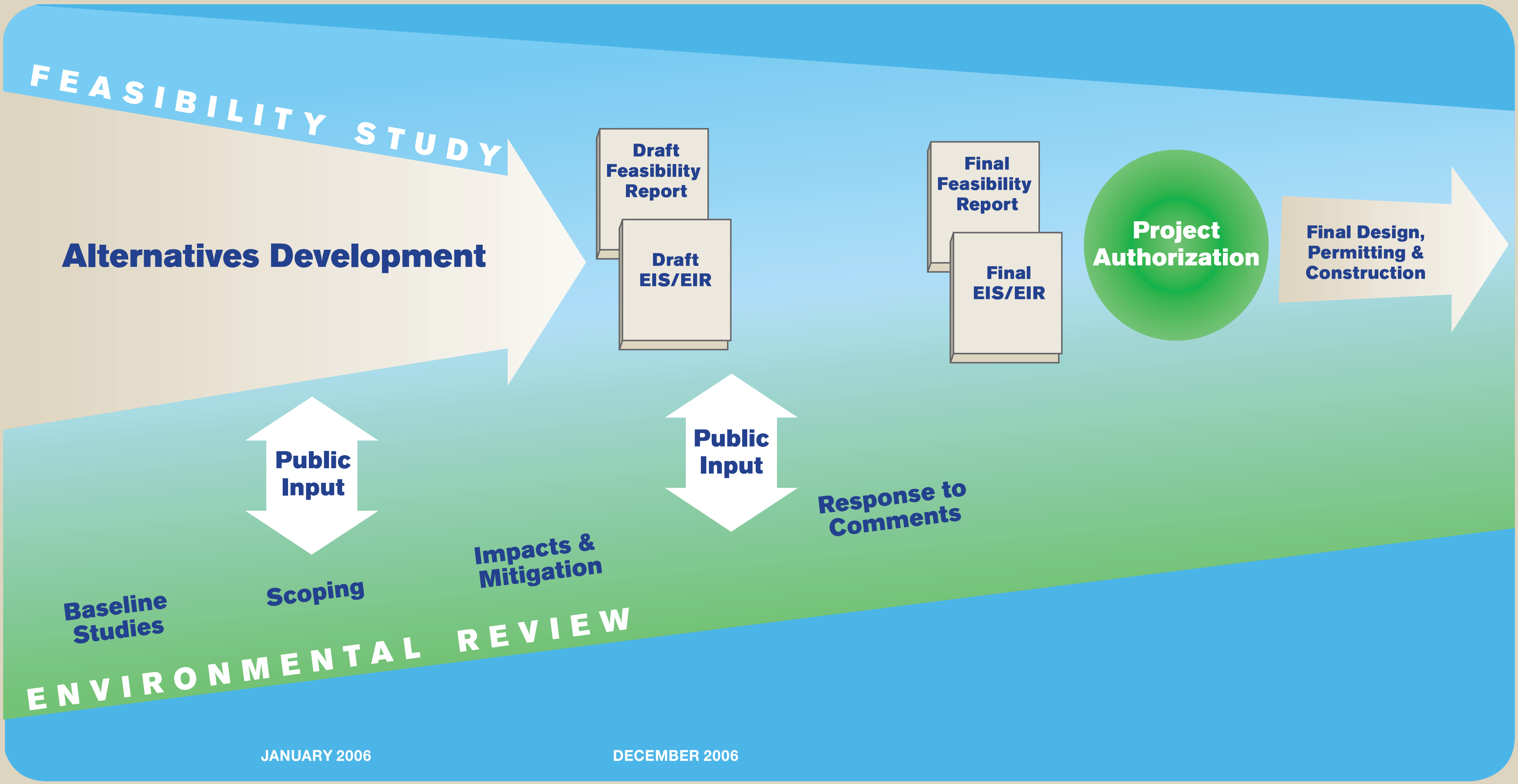
- Changes to Delta salinity
- Changes to the location of the salinity gradient
- Cumulative effect on Delta water quality in combination with other Delta diversions

Delta Hydrology

- Availability of water for diversion
- Changes in local water levels, flows and circulation
- Cumulative effect on hydrology in combination with other Delta diversions

Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

STUDY PROCESS SCHEDULE



Appendix D-3
Public Meeting Presentation

Los Vaqueros Reservoir Expansion EIS/EIR

Public Scoping Meetings

Sacramento, January 24, 2006 (1:30 – 3:30 p.m.)

Antioch, January 24, 2006 (6:00 – 8:00 p.m.)

Livermore, January 25, 2006 (6:00 – 8:00 p.m.)

Concord, January 26, 2006 (6:00 – 8:00 p.m.)

1

Introductions

- Charles Gardiner, CirclePoint
- Marguerite Naillon, Contra Costa Water District
- Patricia Roberson, Bureau of Reclamation
- Other Team Members
  - Leslie Moulton, Environmental Science Associates
  - Steve Cimperman, CA Department of Water Resources

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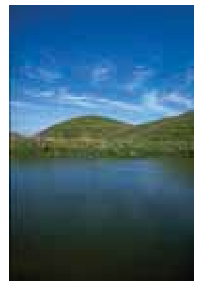
Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Presentation Agenda

- Welcome / Meeting Purpose
- Overview of Environmental Review
- Project Schedule
- Public Comment
  - Hear comments related to topics to address in the EIS/EIR



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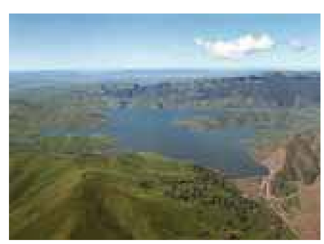
Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Environmental Review

- Contra Costa Water District and Bureau of Reclamation are currently evaluating if an expanded Los Vaqueros Reservoir could:
  - Provide lower cost water for the Environmental Water Account
  - Improve water supply reliability for Bay Area water users
  - Improve water quality for Bay Area water users



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Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Environmental Review

- CCWD and Reclamation will publish a joint Environmental Impact Statement / Environmental Impact Report (EIS/EIR)
- Federal Environmental Review (NEPA)
  - Lead Agency – Bureau of Reclamation
- State Environmental Review (CEQA)
  - Lead Agency – Contra Costa Water District

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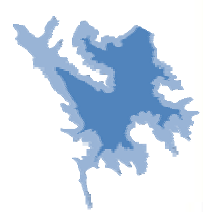
Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Environmental Review

- Purpose of the EIS/EIR:
  - Identify and disclose potential environmental impacts of project alternatives
  - Identify mitigation to reduce or eliminate significant environmental impacts
  - Identify a preferred alternative
  - Support preparation of federal Feasibility Report



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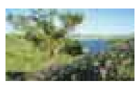
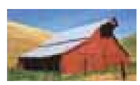
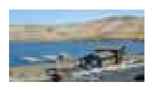
Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Environmental Review

EIS/EIR will evaluate:

- Aesthetic Resources
- Agricultural Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Fisheries
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use
- Noise and Vibration
- Recreation
- Transportation and Circulation
- Utilities and Public Services
- Growth-Inducing and Cumulative Effects

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Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Federal Project Review

- The Bureau of Reclamation includes the EIS with the Feasibility Report submitted to Congress
- Feasibility Report includes:
  - EIS/EIR
  - Engineering feasibility
  - Economic analysis
  - Recommended plan

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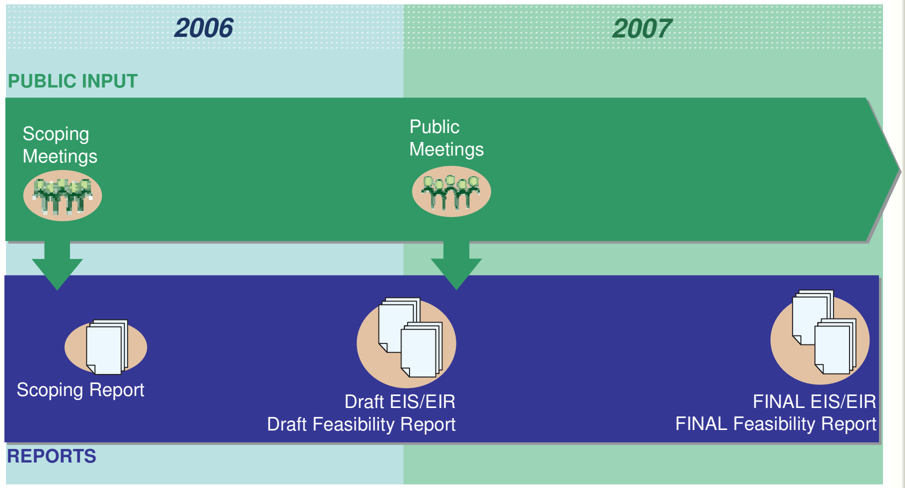
Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

Project Schedule



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Los Vaqueros Reservoir Expansion EIS/EIR • Public Scoping Meetings

How To Stay Involved

- Provide comments today
- Submit written comments on scoping by 5:00 p.m. on February 28, 2006
- Contact CCWD and Reclamation with any questions
- Visit project websites for updated project information

www.lvstudies.com

www.usbr.gov/mp/vaqueros

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Public Comments

- Oral and written comments will be documented in a Scoping Report
- The Scoping Report will indicate how comments will be addressed in the Draft EIS/EIR

Guidelines for Public Comment Period

- Submit a speaker card with your name and comment topics
- Facilitator will invite each speaker to the podium
- State your name and affiliation
- Respect any time limits to provide all participants an opportunity to speak

Contact Information

Please send written comments in by
5:00 p.m., Tuesday, February 28, 2006

to

Marguerite Naillon, Contra Costa Water District
P.O. Box H20 - Concord, CA 94524-2099
(925) 688-8018
fax (925) 686-2187
lvstudies@hotmail.com

or

Patricia Roberson, Bureau of Reclamation
2800 Cottage Way - Sacramento, CA 95825-1898
(916) 978-5074, TDD (916) 978-5608
fax (916) 978-5094
proberson@mp.usbr.gov

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Appendix D-4
Comment and Speaker Cards

LOS VAQUEROS RESERVOIR EXPANSION EIS/EIR

COMMENT CARD

Comments may be submitted today or mailed to:
Los Vaqueros Reservoir Expansion Project
c/o Contra Costa Water District
P.O. Box H2O
Concord, CA 94524-2099

Please submit comments by 5:00 p.m. February 28, 2006

Name: ______________________________

Affiliation: ______________________________

Address: ______________________________

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Phone: ______________________________

E-mail: ______________________________

Comments:

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Please use the reverse side or attach any additional pages

Place
Stamp
Here

Los Vaqueros Reservoir Expansion Project
c/o Contra Costa Water District
P.O. Box H2O
Concord, CA 94524-2099

Public Scoping Meetings

Los Vaqueros Reservoir Expansion EIS/EIR

Speaker Card

Date: January 24-26, 2006

Name:______________________________

Affiliation: ______________________________

Address: ______________________________

Phone Number:________________ **Email:**________________

Comment:______________________________

Please submit your speaker card to the registration desk or meeting facilitator.
The facilitator will use the cards to invite participants to provide oral comments during the public comment period.

Public Scoping Meetings

Los Vaqueros Reservoir Expansion Project

Speaker Card

Date: January 24-26, 2006

Name:______________________________

Affiliation: ______________________________

Address: ______________________________

Phone Number: ________________ **Email:**________________

Comment:______________________________

Please submit your speaker card to the registration desk or meeting facilitator.
The facilitator will use the cards to invite participants to provide oral comments during the public comment period.

Appendix E

Scoping Meeting Sign-In Sheets

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Concord, CA - January 26, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Tomi Van de Brooke	CA Alliance for Jobs 2000 Powell	510/547-9305 Street #1125	TomiVdB@Comcast.net Emeryville 94608	web

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Concord, CA - January 26, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
N.E. Jackson	1025 Pasadero Way Clayton Ca	925 672 4E91	flyag4wing@ comcast.net	[illegible]
Peter Margiotta	122 Castle Crest Rd Alamo CA.	925 944-1188	PetePatsy@SBCGlobal.NET	mail
W.E. Smith	1312 Davis Ave. Concord	682-8812		
Craig Fleming	4632-D Melody Ln. Concord 94521	825-9751	navair@earthlink.net	mail
Leslie Stewart League of Women Voters	3398 Wren Ave. Concord 94519	510-839-1608 (days) 510-839-1610 fax	leslie@lwvba-ca.org	e-mail mail
Cynthia Patty	954 Morello Ave. Martinez, CA 94553	925-381-9299	cpatty@horizon.csueastbay.edu	Contra Costa Times online article
Hartley Naas	3751 Lindero Dr Concord CA 94519	925 825 1039	HMNaas@Astound.net	mail
Ave Florance	7109 Bria Loop San Ramon 94582	925 878-8427	aflorance@horizon.csueast bay.edu	contra Costa times online article
Heather Pohl SFPUC	1145 Market St San Francisco 94103	(415) 554-1634	hpohl@sfwater.org	e-mail

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
KARL SCHINDHELM HOME OWNER	2200 ROCKNE DR CONCORD CA 94518	825-5015	NONE	
Grey Whipple Home Owner	2631 Lyon Circle Concord CA 94518	(925) 687-4312	whipple@pacbell.net	CCTimes
EDGAR CRUMP HOME OWNER	974 TIFFANY DR CLAYTON CA. 94517	925 672 3040		MAILED
Wayne Farnholtz Home Owner				
Scott Hein & Claudia Hein	1886 Sagewood Ct Concord, CA 94520	925 671 0401	scott@heinphoto.com	mailer
Rebecca Johnson	4770 Willow Road Pleasanton, CA 94588	925-416-4882	rjohnson@ang newspapers.com	
Art Kroeger Home Owner	5467 Louisiana Dr Concord, CA 94521	925 686-1600	amkepage@sbcglobal .net	Mailer
LECH NAUMOVICH CA. NATIVE PLANT SOCIETY	PO BOX 3057 BERKELEY, CA 94703	510 734 0335	CONSERVATION@EBCNPS.ORG	WORD OF MOUTH
Walter Pease City of Pittsburg	65 Civic Ave Pittsburg 94565	925 252 6966	wpease@ci.pittsburg .ca.us	announcement

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Concord, CA - January 26, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Richard Soderholm	3784 Juniper	827-5678	rsoderho@astound.net	press - other - Post card
Toni Van de Brooke CA Alliance for Jobs	2000 Powell Street #1175	(925) 457-6260	tonivdb@rebuildca.org	

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Sacramento, CA - January 24, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Kristi Sandberg BOR.	2800 Cottage Way	916 978-5217	KSandberg@mp.usbr.gov	
TONY CATIZZONE	10100 W. LINNE RD TRACY, CA 95377	209-836-5050 -832-2115 F	tony_catizzone@ameron.com	NEWSLETTER
AMIR RANGCHI	DWR	657-5084		E-MAIL
Jim Snow Westlands Water Dist	400 Capitol Mall Sacramento, CA	916 321 4519 321 4550	Jsnow@kmtg.com	mail
Bruce Oppenheim NOAA Fisheries	650 Capitol Mall Suite 8 Sacramento, CA	916-930-3603	bruce.oppenheim@noaa.gov	mail
Erika Kegel Reclamation	2800 Cottage Way	916-978-5081	ekegel@mp.usbr.gov	

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Sacramento, CA - January 24, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Cindy Kao SCVWD	5750 Almaden Expressway SJ CA 95118	408 265 2600	ckao@valleywater.org	
Leigh Barton USFWS	2800 Cottage Way Rm W-2605 Sac	916-414-6729	aondrea_barton@fws.com	
Vicki Fry SRCSD	10545 Armstrong Ave Mather CA 95655	916-876-6113	fryv@saccounty.net	
~~Ghassan~~ AlQaser	1416 9th St		galqaser@water	
Hari Rajbhandari	1416 9th St.	916 6575771	hari@water.ca.gov	
Tom Boardman	1521 I St. Sac 95814	916 441-2249	hydrobro@ix.netcom.com	
Robert DuVall	901 P St. Sac 95814	916 651-9680	rduvall@water.ca.gov	
Annie Parker DWR	1416 9th St.	653-3925	aparker@water.ca.gov	
Greg Young Tully & Young	3600 American River Dr. St-260 Sac CA 95864	916 669 5356	GYoung@TullyandYoung.com	

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Sacramento, CA - January 24, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Pete Jacobsen	MWD	916 650 2620	Pjacobsen@mwdh2o.com	
Dawn Sanders Koepke	McHugh's Associates 1107 9th St. Ste 701 Sacto CA 95814	916/930-1993 916/930 0580 fax	dsanders@mchughandassociates.com	email
Anna Holmes	4001 N Wilson way Stockton, Ca 95205	209-948-7163	aholmes@delta.dfg.ca.gov	
Don Rasmussen				
Dave Forkel	DW	510-693-9977		

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Antioch, CA - January 24, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Michelle Blackwell Concord Resident	1306 Davis Ave Concord		gemusic eastbound.net	Direct Mail Piece.
Janess Hanson Delta Group Sierra Club	431 Levee Rd Bay Point 94565	925 458-0860	janesshanson@ earthlink.net	direct mail

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Antioch, CA - January 24, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
BOB DORAN TOWN OF DISCOVERY BAY	4920 CABRILLO PT DISCOVERY BA 94514	925/634-5137	DBREDBOB@SBCGLOBAL.NET	HANDOUT
R Verderber Antioch	530 Burwood Wy Antioch, CA 94509	925 779-9751		Paper
Remy Goldsmith ~~#2~~ Rep. Ellen Tauscher	420 W. 3rd St Antioch, CA 94	925) 757-7187	remy.goldsmith@mail.house.gov	mailing

Los Vaqueros Reservoir Expansion EIS/EIR - Public Scoping Meetings

Livermore, CA - January 25, 2006

Name/Affiliation	Address	Phone/Fax	email	How did you find out about the meeting?
Kenneth Henneman		925 846 4450	forken@ix.netcom.com	Paper
Karen Sweet	3585 Greenville Rd #2 Livermore 94550	925 371 0154 x111	ksweet@baysavers.org	Waternews list serve
JOAN STEWART FPL ENERGY	6185 INDUSTRIAL WAY LIVERMORE, CA 94550	925-245-5529	JOANNE_STEWART@FPL.COM	LOS VAQUEROS WEBSITE
Gene Boardman	4051 East Ave LIV. 94550	925 447-5982	gboardman@sbcglobal.net	e-mail
Dale Myers	538 Rachelle St LIV 94550		dmyers@zone7water.com	work
THOMAS NIESAR ACWD		510-668-4210	THOMAS.NIESAR@ACWD.com	MAILING.
MANUEL PERRY	10781 MORGAN TERR Rd LIVERMORE	925-443-9307		PAPER
Greg Bequette	10203 Morgan Territory Rd Livermore	925 449 4739	bequette1@ewnet.net	mailing

Appendix F
Transcripts of Oral Comments

ORIGINAL

REPORTER'S TRANSCRIPT OF

Los Vaqueros Reservoir Expansion EIS/EIR

Public Scoping Meetings.

Sacramento, January 24, 2006 (1:30 to 3:30 p.m.)

Reported by: Angela N. Pickert

CSR #12995

(Whereupon, the presentation portion of the
meeting started at 2:20 p.m., not reported.)

Public comment from Vicki Fry, Sacramento Regional County Sanitation District, 10545 Armstrong Avenue, Suite 101, Mather, CA 95655.

MS. FRY: In reference to the study process scheduled, I was curious why it doesn't indicate when the Los Vaqueros expansion is going to be compared to the other potential water storage projects identified by CALFED as warranting further study?

MR GARDINER: Okay.

MS. FRY: I think it needs to. And if CALFED hasn't clarified when they're going to do that, how they're going to do that, I think they need to.

MR GARDINER: Okay.

Any other comments? Okay. Last chance to provide us comments.

All right. What an easy crowd. I would encourage you, again, to come by the boards, particularly the last three here that highlight the environmental topics that were on the slides Marguerite covered.

And so if you have particular environmental issues that you're concerned about, you might want to talk to team members about that, get a little more specifics, and then feel free to specify them in written comments.

So thank you very much.

(Meeting concluded at 2:30 p.m.)

CERTIFICATE OF REPORTER

I, ANGELA N. PICKERT, hereby certify that said proceedings were taken in shorthand by me, a Certified Shorthand Reporter of the State of California, and were thereafter transcribed by computer-aided transcription, and that the foregoing transcript constitutes a full, true, and correct report of said proceedings which took place.

That I am a disinterested person in the said action.

IN WITNESS WHEREOF, I have hereunto set my hand this 30th day of January, 2006.

Angela N. Pickert

ANGELA N. PICKERT
CSR No. 12995

ORIGINAL

REPORTER'S TRANSCRIPT OF

Los Vaqueros Reservoir Expansion EIS/EIR

Public Scoping Meetings

Antioch, January 24, 2006 (6:00 to 8:00 p.m.)

Reported by: Angela N. Pickert

CSR #12995

(Whereupon, the presentation portion of the meeting started at 6:45 p.m., not reported.)

Public comment from Janess Hanson, Delta Group of the Sierra Club, 431 Levee Road, Bay Point, CA 94565.

MS. HANSON: I'm Janess Hanson, and I live at 431 Levee Road, Bay Point, California 94565.

I'm here probably representing myself and Bay Point because I've looked at the Delta for 45 years, living right on the last street next to the Delta, but I'm also representing the Delta Group of the Sierra Club.

Our group is from Bay Point, Discovery Bay, and we drink the water that will -- is in the reservoir now. And I personally was on the first go around for about two years going to meetings before the original vote to start the feasibility study. And it almost feels like the dinosaur age because there's so many things that have changed since then, some things that have been added to the pot.

The proposal to enlarge the reservoir four or five times, diverting that much more water from the Delta, and the extra diversions that the State and Federal Government are -- already have in place or are proposing, the population explosion in California, all those things, and all the studies, all the studies from all the water agencies on every level to save the health of the Delta so far have not worked because it's all -- the studies show it's down the tubes, you know, it's not working. All those studies, it's not working so -- and I realize it's not just the diversions, it's a whole lot of other things that are happening. But I wish that your study will -- would include some way that we could really make the Delta healthier in spite of diverting all the water from it, you know. It doesn't compute.

But one thing, in the two years of meetings that I went to, one subject that was not addressed and that has come up front and center all over the world is global warming. I don't remember hearing a thing about -- well, we know with the polar ice caps melting that the water level for the whole world is going to be higher. The salt intrusion will be going up farther. It will be stronger up into the Delta. There won't be the snow -- the snow melt. There won't be any snow to melt because the way the temperature is changing. You won't have that steady flow of melt through the year that we've always had.

So really, the minimum amount of water that's available is going to be less, and I don't see how that can help but affect the quality and quantity of the water that's available for, what, two-thirds of the state to use. And I don't see how the health -- that the Delta can stay healthy. So I'm hoping that those issues will be addressed in your draft EIR.

MR. GARDINER: Okay. Good. Anything else?

MS. HANSON: That's it.

MR. GARDINER: Okay.

Any other comments from other guests? No? Okay. I think we're done then.

(Meeting concluded at 6:57 p.m.)

CERTIFICATE OF REPORTER

I, ANGELA N. PICKERT, hereby certify that said proceedings were taken in shorthand by me, a Certified Shorthand Reporter of the State of California, and were thereafter transcribed by computer-aided transcription, and that the foregoing transcript constitutes a full, true, and correct report of said proceedings which took place.

That I am a disinterested person in the said action.

IN WITNESS WHEREOF, I have hereunto set my hand this 30th day of January, 2006.

Angela N. Pickert

ANGELA N. PICKERT
CSR No. 12995

ORIGINAL

REPORTER'S TRANSCRIPT OF

Los Vaqueros Reservoir Expansion EIS/EIR

Public Scoping Meetings

Livermore, January 25, 2006 (6:00 to 8:00 p.m.)

Reported by: Angela N. Pickert

CSR #12995

(Whereupon, the presentation portion of the meeting started at 6:47 p.m., not reported.)

Public comment from: Karen Sweet, 3585 Greenville Road, #2, Livermore, California 94550.

Gene Broadman, 4051 East Avenue, Livermore, California 94550.

Manuel Perry, 10781 Morgan Territory Road, Livermore, California 94550.

MS. SWEET: Well, I only filled it out as a formality and not knowing, you know, what the presentation was going to be including, so I do not have a particular comment or question.

MR. GARDINER: Okay. Did you want to make a comment?

MR. BROADMAN: My name is Gene Broadman. I'm a landowner in North Livermore, and when I look at your environmental review, I would like to see a thorough economic analysis of the cost associated with this project and the potential costs of water acquisition and potential cost to the users.

MR. GARDINER: Okay. Great. Any other issues? Anyone?

MS. SWEET: May I ask in particular, what you are focusing on? In Livermore or the whole area or perhaps bringing that -- I mean, I don't mean to put --

MR. BROADMAN: It's a multiple part question. There's expansion of the reservoir itself and those costs. There's water acquisition costs, and then there's distribution costs to get it to the various users. And it would be nice to have some idea whether the whole thing makes economic sense or not.

MR. GARDINER: Okay. Anybody else want to make a comment?

MR. PERRY: I'd like to make a comment.

MR. GARDINER: Okay.

MR. PERRY: My name is Manuel Perry, 10781 Morgan Territory Road. And originally when you were getting ready to put in the facility it was the Contra Costa Water District and their users. I noticed on your Slide No. 2 it talks about Bay Area users and not Contra Costa, which leads to my next comment is, the money -- I thought the money at first or at least previously came from Contra Costa taxpayers to pay for the dam. If the Federal Government is going to get involved, who controls the water or the water usage?

MR. ROBBINS: Sir, are you a homeowner or are you a --

MR. PERRY: Homeowner.

MR. GARDINER: Any other comments?

MS. SWEET: I'd like to expand on that just a little bit in that it raises the options to have it addressed, the ag water feasibilities bring it to the Livermore Valley, specifically.

MR. GARDINER: So consider the potential to deliver ag water to the Livermore Valley?

MS. SWEET: Yes.

MR. GARDINER: Any other thoughts?

MS. SWEET: We've been working a lot here in the Livermore Valley on ag viability and beginning to spend more time working on the range land, and so obviously, loss of grassland, if that's ag viability, and I would really like consideration for the mitigation plans for that loss and the habitat to be in consideration for local mitigation dollars to sustain the local agriculture economy.

MR. GARDINER: Loss of grassland, I assume, you mean grassland that's used for grazing?

MS. SWEET: Right.

MR. GARDINER: And for business?

MS. SWEET: Yes. But I don't think you have any land for the watershed.

MR. GARDINER: Any other things?

MR. BROADMAN: Is there any impact on Vasco Road as it goes from the Alameda County-Contra Costa County line up into the Brentwood area, and how would that be mitigated?

MR. GARDINER: So you mean traffic, transportation impact on Vasco Road?

MR. BROADMAN: Yes.

MR. GARDINER: Okay. Great. Any thoughts on that topic? Issues?

Okay. I think we'll break. We can answer additional questions. We'll probably follow up with some of you on some additional questions that we can probably answer right now, but we'll break the formal part of this.

Thanks very much for coming. I appreciate it.

(Meeting ended at 7:02 p.m.)

CERTIFICATE OF REPORTER

I, ANGELA N. PICKERT, hereby certify that said proceedings were taken in shorthand by me, a Certified Shorthand Reporter of the State of California, and were thereafter transcribed by computer-aided transcription, and that the foregoing transcript constitutes a full, true, and correct report of said proceedings which took place.

That I am a disinterested person in the said action.

IN WITNESS WHEREOF, I have hereunto set my hand this 30th day of January, 2006.

Angela N. Pickert

ANGELA N. PICKERT

CSR No. 12995

ORIGINAL

LOS VAQUEROS RESERVOIR
EXPANSION EIS/EIR
PUBLIC SCOPING MEETING

---oOo---

Taken before CYNTHIA T. WALLIS

Certified Shorthand Reporter

State of California

CSR No. 12369

January 26, 2006

P R O C E E D I N G S

MR. GARDINER: Okay. We're going to start with Peter Margiotta.

MR. MARGIOTTA: Good evening. I'm here representing myself, and I'm affiliated with California Waterfowl Association and Safari Club International.

I submitted five questions in writing to you. I want you to consider the importance of the recreational value of scull-boat hunting on the enlarged reservoir and on the current reservoir and the positive effect of hunting opportunities in the delta. I think all of you will recognize that recreational activities in Contra Costa County are seriously derogated because of a lack of facilities and opportunities. And when that occurs, it further derogates the quality and life in our county. Please note that scull-boat hunting is allowed on many reservoirs and forebays which are adjacent to waterfowl hunting areas.

What will the biological impact on the Pacific waterfowl migratory be when unnatural rafting is allowed to occur on a new and larger reservoir?

Three, what will the impact on the water quality be, the salinity, when the existing reservoir is taken out of operation and the district diverts water out of Middle River? This question obviously needs an analysis of water quality in Middle River at your anticipated point of diversion, and you should consider a variety of water-year types so it's not just an average, but also including drought years.

Number four, based on what you learn with regard to the water quality conditions in Middle River, you should consider an alternative of leaving the existing reservoir in place and changing your existing point of diversion on Old River to a new point of a diversion on Middle River. This alternative will support your ratepayers' strong position and oppose a peripheral canal.

And fifth, have your ratepayers been informed that a new and enlarged Los Vaqueros Reservoir will, in fact, facilitate the building of a peripheral canal. And if they have not been informed, how will they be informed?

Now, some people will say that's real conjecture. I think reality has it that should this reservoir not be built and you not change your point of input or taking water, and a peripheral canal or some version of a peripheral canal is built around the back of the delta, Los Vaqueros Reservoir of Contra Costa

Water District will not be able to continue drawing water where it's drawing from now. And the politics of that will facilitate the agency making a deal to put your straws in where -- into the peripheral canal making the metropolitan district very happy.

So I perceive the building of a larger reservoir not addressing the three issues, but really addressing the transporting of more water south with a lot of verbiage in terms of environmental issues being addressed in selling the project. I also feel that water foul recreation in the delta is potentially a huge economic benefit to the current -- to what is currently being done, and I'm sure everybody has seen and read about the potential levy derogation and subsidence of the islands. Well, the real clear way to prevent continued subsidence and ways to provide economic benefit to the landowners could involve enhancing the wetlands in the delta. And I tonight is not the time to get into that, but I would appreciate it if -- the opportunity to present these questions, and they then could be addressed in your scoping review.

MR. GARDINER: Could I ask you -- I will start my question about your point number three.

Was that concern that, while the existing reservoir is out of commission, your concern about salinity, impacts the water supply?

MR. MARGIOTTA: Well, I'm concerned about just exactly what the question says. I'm concerned about the salinity that will be taken out of -- when you start drawing water out of Middle River, what happens to the water overage (sic)?

Let me see, how did I word that?

MR. GARDINER: What the impact on the water quality would be?

MR. MARGIOTTA: Correct.

MR. GARDINER: Okay.

MR. MARGIOTTA: I carefully worded that, and I'm not sure if what I just said matches the wording.

MR. GARDINER: But you're going to give us that in writing?

MR. MARGIOTTA: I'll give you that in writing.

MR. GARDINER: Okay.

Lech Naumovich.

Does anybody else want to give me a blue card?

MR. NAUMOVICH: Hi, good evening. I'm here on behalf of the California Native Plants Society, and I will give you also something in writing. And first of all, I want to specify that this will be the first of a couple of comments that we would like to give to you.

We want to, first of all, get on the record we are very interested in this project, and we are very happy to be participating in the scoping process, in EIS and EIR. And we would like to, together, figure out how we can best work through this project. First of all, the CNPS, for those folks that don't know, California Native Plant Society, is a statewide organization of about 10,000 members, and our mission is to spare the native plant communities in California.

We have a couple of issues that we want to bring up or a couple of comments that we would like you to consider for the scoping. First of all, we want you to really consider the ecosystem level affects of what is going to happen in this project. Understandably this is a large project. I guess the estimate I got was around one- to one-and-a-half billion dollars, and we want to know and have it in writing to the EIR, A, is it economically feasible and is it environmentally feasible for what we want to do? We're concerned about the withdrawal of water from the Bay delta estuary. As everyone here in this room knows, our Bay is a very valuable resource, and withdrawing additional water from freshwater from the system is going to probably have some enormous repercussions in the Bay. It's very hard to characterize those because of the -- this manner and the complex ecological modelings.

One thing we would really like to see is some modeling that would talk to the questions of what is going to happen to salinity levels, locally drawing points and also into the Bay, where the fresh water would normally come in. And I know it's going to affect local population.

A second comment on this is, as I understand, a lot of these -- one of the main goals he indicated for this project is going to aid in fish recovery and aid in the ecosystem particularly for fish. While we think this is a noble cause, we would like you to consider whether our management for fish health is going to -- the fact that we are going to manage, specifically for fish health, is that going to have repercussions on all ecosystems?

Moving along, I just wanted to state for the record there are 92 eco-protected plants that we have listed. We would hope that all those would be considered in its process. In terms of producing a comment that's useful, we would like to see some mapping of those. In addition, we would like to see mapping over a number of years, good years and bad years for plants depending on temperature, depending on rainfall. So we would like you to really consider where there may be other populations that we may be losing. There are two plants that in particular, calochortus pulchellus and also the thysanocarpos radians. These may be a little technical for this, but those are listed in here, and we would like special consideration for those.

The last set of comments I would want you to consider is the mitigation pressures. We understand there may be -- if the largest 5,000 -- 500,000-acre reservoir is improved, if that plan is improved, it's scheduled to inundate mitigations from the initial dam construction, and that includes a lot of valley oak planting, and a lot of community groups that have participated in this process. We wanted to make sure that, A, those mitigations are considered in addition to mitigation that will come from this project in itself. So I hope that makes sense. There are two tiers of mitigation to be considered.

In addition, we -- I think that pretty much finishes. I have a list of mitigations in this paper that I won't completely go through step by step, but, again, we wanted to thank you for inviting the Native Plant Society, and we look forward to working with you, and hopefully you can do the best job possible in this process.

MR. GARDINER: I just received another card. Tomi Van den Brooke. Just introduce yourself and your affiliation and the comments you have.

MS. VAN DE BROOKE: Thank you.

Tomi Van de Brooke, and I'm here tonight on behalf of California Alliance for Jobs. We are a labor management partnership representing about 2,000 heavy construction firms and 50,000 workers in Northern and Central California.

We have been watching this project very closely, and we would like to request that the EIR/EIS look at issues that carefully constitutes increasing water supplies, providing assurance of water during drought and improve water quality at all times. We think that the EIR/EIS should look at providing an environmental water account through an expanded Los Vaqueros and not just the cost of providing the EWA water as stated in the project description. We think it's very important for the economic vitality of the region and look forward to seeing how the EIR comes out.

Thank you.

MR. GARDINER: Okay. Anybody else? Last chance. Anybody else want to provide us a comment on the environmental document? You're an easy crowd. Okay. We'll close the formal comment period. Again, if you have questions, come find anybody with a name tag, and we would be happy to answer the questions, and feel free to send us written comments any time.

(Whereupon the proceedings were concluded at 7:13 p.m.)

CERTIFICATE OF REPORTER

I, CYNTHIA T. WALLIS, hereby certify that said proceedings were taken in shorthand by me, a Certified Shorthand Reporter of the State of California, and were thereafter transcribed by computer-aided transcription, and that the foregoing transcript constitutes a full, true and correct report of said proceedings which took place.

That I am a disinterested person in the said action.

IN WITNESS WHEREOF, I have hereunto set my hand on this date February 7, 2006.

CYNTHIA T. WALLIS
CSR No. 12369

Appendix G

Written Comments Received During Public Review Period

ESA

THE WOLF COMPANY

JAN 2006
RECEIVED
CONTRA COSTA WATER
DISTRICT
CALFED

The Wolf Company
852 Golf Club Circle
Pleasant Hill, CA 94523
P.O. Box 5071
Walnut Creek, CA 94596
(925) 685-WOLF
FAX: (925) 798-FAXX

ARTISTIC SERVICES

DATE: 1/13/06

TO: Los Vaqueros Reservoir – Expansion Project

ATTN: Ms Marguerite Naillon

FROM: C Ms/ Waltraud A. Heinritz

MESSAGE:

Re: Expansion Project

Before planning any expansion let us carefully assess what is good and bad about the Los Vaqueros Reservoir as it exists.

Sincerely

C Ms/ [signature]

Senator John A. Nejedly, Retired
400 Montecillo Drive
Walnut Creek, California 94595
925-934-4559

February 27, 2006

Ms. Marguerete Naillon
Project Manager
Contra Costa Water District
P.O. Box H20
Concord, CA 94524

Dear Ms. Naillon:

Subject: Draft Environmental Impact Report Statement

Please accept the accompanying observations as part of the Comments on the Los Vaqueros Dam and Reservoir project E.I.R.

Thank you.

Very truly yours,

John C. Nejedly

John A. Nejedly

Enclosure

DRAFT ENVIRONMENTAL IMPACT REPORT STATEMENT
LOS VAQUEROS RESERVOIR PROJECT E.I.R.

THE FOLLOWING OBSERVATIONS CONCERNING THE INITIAL ALTERNATIVES INFORMATION REPORT OF THE LOS VAQUEROS EXPANSION INVESTIGATION, CALIFORNIA, OF SEPTEMBER 2005 ARE PRESENTED FOR INCLUSION IN THE PROCEEDINGS.

First, the critical significance of the "Islands" of the Delta and their levees in this or any other Delta project must be objectively established and understood before any project in the Delta is planned.

The recent Sacramento Conference of the Water Education Foundation has provided a solid base through which that understanding can be provided. In order that the public have access to information provided by that conference, a full report upon the meeting should be included in this Expansion Project Investigation.

For the purpose of this analysis, specific points raised in the conference are here referred to. In particular, the comments of Ronald Light, U.S. Army Corps of Engineers; and Lester Snow, former Director of CalFed, a consortium of State and Federal water export agencies established to provide management of the Delta, their own activities, water export projects, and state water resources.

Mr. Snow observed that, "Delta levees were not and are not being given a priority by the State and CalFed process, levee restoration has lagged, our management system is broken, and unless the critical element of levee failures is understood and properly responded to, we're going to have disaster after disaster. Levees are a critical element of Delta planning." Mr. Light made it clear that levees will continue to fail. That failure precipitates enormous property and personal losses and expenditure of public funds and degradation of Delta water quality, to the point that those dependent upon continuing delivery cannot be provided for. In one year alone, 1997, 32 levees failed.

Levee failures, such as the Jones' Tract breach, draw salt laden estuarian waters into the Delta, limiting or terminating delivery to local and water export requirements by reason of quality degradation. That circumstance continues until quality is restored by river flows and reservoir releases. Should there be a concurrent period of drought, inadequate river flows and depleted reservoir sources will extend the period of recovery until adequate water is available.

The period of time between levee failure and restoration of Delta water quality, should quality have been diminished, depends upon the availability of public funds to establish public security and restore Delta water quality. The source of such funding must be identified, and the certainty of its availability must be established, as well as responsibility for dam failure.

Levees susceptible to failure by reason of their foundations and core material are a critical element of Delta ecology. A program for their management must be in place prior to any project dependent upon Delta quality, and absolute assurance of the certainty of the funding for levee failure must be in place before project implementation.

Except for the unfortunately under-funded Army Corps of Engineers investigations, there is no substantially well-founded information available to assist preparation of a project dependent upon Delta water quality.

The project investigation must not only fully report upon potential movements in the extensive fault planes of the Delta and how they relate to project structures, but also to their effects upon Delta water quality. That potential, of earthquakes in the seismically active Delta, has been considered only by the East Bay Municipal Utility District, but its study is limited to the "islands" providing aqueduct support. Failure of levees anywhere in the Delta can affect the entire Delta and the EBMUD aqueducts.

Limiting the investigation to levee restoration is not appropriate. A more appropriate alternative may be to simply allow flooded islands to remain flooded. However, all alternatives to resolution of the inevitable levee failures must be inventoried and response, adequately funded in advance, must be in place in order to establish future project compatibility with the plan of response to levee failures. Each "island" must be considered independently of all others, and consideration must be given to the particular circumstances of each.

An alternative to destruction of Los Vaqueros Dam is proposed. That alternative is a 25,000 A.F. additional capacity to the present Los Vaqueros Dam. During the design of the Dam, the point was raised by the Board of Consultants of the California Division of Safety of Dams that the foundation of the dam as proposed would not be adequate to support a larger dam if one were later required.

The Board suggested that a higher dam could be later constructed at the site in order to provide much more storage if changes in the design were made.

During the design of the dam it was commented that, "The District advised the Board there was no need to provide additional storage and that they were not interested in the added expense, as the project was sufficient for CCWD needs. The net result of the District's decision not to build the Los Vaqueros Reservoir Dam so that it could be raised was that the dam as now constructed cannot be raised. The core is too thin and porous material in the left abutment, combined with the design of the core, requires that the dam must be torn down before a new, higher dam can be constructed."

There is now a reevaluation of that conclusion. It is now claimed that the dam can now safely be raised to accommodate an additional 25,000 A.F. of storage without structural alteration. The circumstances that changed the opinion must be made known.

During the design for Los Vaqueros all the Bay Area agencies involved in water management, environmental protection, water quality, and CalFed were repeatedly solicited to join in the project so its capacity would be adequate to serve all needs. <u>None indicated any interest in the project.</u> Now it is claimed that even with a 25,000 A.F. increase in capacity it "does not appear to adequately meet the project objectives of Bay Area water quality, Bay Area water supply reliability, and Delta fisheries protection."

In the bond issue instructional material in support of the Los Vaqueros project provided by the District to the Concerned Citizens for Improved Quality Water that provided support for the initial Los Vaqueros project, the question was raised as to the reservoir capacity; i.e., was it adequate? It was a rather often repeated inquiry during the meetings.

The Committee was advised by CCWD that it was adequate and that a larger dam or storage area was not required. That point was an important issue, as it was considered that the Bureau of Reclamation C.V.P. Kellogg Reservoir was foreclosed as there was no space available for two dams and reservoirs.

Raising the present Los Vaqueros Dam without structural change is inconsistent with prior determination. If the dam is raised without changes, where will responsibility for failure lie?

Other issues requiring consideration are, what agency will construct and operate the project, and what properties owned by CCWD will be required to be conveyed to another agency and at what compensation?

An inter-tie system for Bay Area water supply agencies is now being prepared. A final program is premature until a comprehensive levee course of action is in place and funded.

Alternatives to the project are suggested. The highest and most beneficial use of the resource is domestic requirements. Allocation to that use can be increased without the project.

Substantial areas of land in the Central Valley have been rendered useless for husbandry by unregulated accumulations of agricultural toxins. Water is still delivered by contract for farming, which is now impossible. Those contracts must be terminated for failure of purpose. If unused for farming, that supply must be redirected to domestic use now in critical demand.

The delivery of the highest quality Sierra sources for crops that do not need that quality of water and can be grown in areas without irrigation while domestic requirements are turned to treated sewage. Reassignment of that source to domestic priority will provide an alternative to increased demands upon an already impoverished Delta without the project.

Further studies show that a 12% reduction in water allocations to agriculture will provide a 100% increase in domestic supply.

Long-term planning is an absolute requirement for Resource Administration. Present regulation cannot provide long-term administration.

Water management on both State and Federal levels now is provided by agencies directed by appointed officials whose tenure is limited to that of the appointing authority, which is determined at each succeeding election. Actions and decisions of the agencies are subject to judicial intervention, absence of legislative support by required legislation and funding, and rescission of critical decisions by legislation or veto of the appointing authority.

Critical, as well, is the reality that subsequent administrations appoint new officials and redetermine agency objectives and the means of securing them. Critical elements of water projects have been eliminated by subsequent administration or legislative refusal to provide funding. A case in point is the San Luis Drain planned but never provided leaving untreated agricultural wastes in the San Joaquin River.

That point raises the propriety of management by officials whose regulatory actions and plans can be set aside at the next election. For example, the recent reversal of a fundamental principal of forest regulation by the election of a president.

Another issue related to the fact that present resource control is vested in appointed officials of the state and federal water export projects whose primary interest is the fulfillment of export projects' objectives. However, for public agencies the sole responsibility is and must be serving the public interests.

The dichotomy is self-evident.

The proceedings must consider an alternate public agency secured through a representative bureau serving all interests. The potential for catastrophic events incident to Delta and Katrina levee failures is now clearly evident. Also made known, as judged by the record, is the absence of a long-term plan, preparation for, and management of Delta levee failures.

A Delta project that will affect Los Vaqueros Dam and Reservoir water quality is now proposed. Thus, the Environmental Impact Report required for this project provides an opportunity to include in the proceedings the critical need for a competent long-term public agency secured through a representative government procedure properly funded to respond to inevevitable levee failures.

The people of California critically dependent upon access to Delta water sources were deprived of that supply in but one levee breach of relatively minor consequence until Delta quality could be restored by reservoir releases and river flows. Had there been a concurrent drought, such as that of '76-'77, the consequences could have been catastrophic.

A program for competent levee management in the public interest must be identified in the Environmental Impact Report. Therefore, public participation in this project must be as extensive as possible. Prior to the implementation of any project dependent upon Delta water quality, a long-term program for levee management must be in place and must require private funding for private benefits. Absolute assurance of project funding must be demonstrated, particularly if the present Los Vaqueros dam is proposed to be destroyed.

These considerations are requested to be made a part of the decision process.

Submitted By:

John A. Nejedly

John A. Nejedly
February 27, 2006

MT. DIABLO AUDUBON SOCIETY
P. O. BOX 53
WALNUT CREEK, CALIFORNIA 94596

February 23, 2006

Ms. Marguerite Naillon, Project Manager
Contra Costa Water District
P. O. Box H20
Concord, CA 94524-2099
Fax: (925) 686-2187

RE: Los Vaqueros Reservoir Expansion Project

Dear Ms. Naillon:

Thank you for this opportunity to comment on the Notice of Preparation of the Environmental Impact Report for the Los Vaqueros Reservoir Expansion Project. On behalf of the Board of Directors and members of the Mt. Diablo Audubon Society (MDAS), I would like to express a few of our serious concerns regarding the environmental impacts of the proposed expansion.

We support the need to protect native fisheries and to provide a reliable supply of high-quality drinking water for Contra Costa Water District's customers. However, we believe that the proposed reservoir expansion and new ancillary facilities will have significant environmental impacts which cannot be adequately mitigated.

If the reservoir is expanded up to a 500,000-acre-foot facility, nearly 2,000 acres of grassland, oak woodland and wetlands will be inundated. These plant communities provide habitat for a number of special-status species, such as the San Joaquin kit fox, Alameda whipsnake, California tiger salamander, California red-legged frog, Golden eagle and other raptors. Portions of the area to be inundated are protected from such an incompatible use by perpetual conservation easements, which were required to mitigate for the environmental impacts of the initial reservoir project. To the best of our knowledge, there is no legal precedent for "breaking" these conservation easements, and we would oppose their extinguishment. Flooding these areas would also disrupt important wildlife corridors which allow seasonal movement and connect core reserves vital for foraging and reproduction. We are also concerned about the broader temporal disruption and impacts to species and habitat caused by construction of the various pipelines and other facilities contemplated by this project.

An overriding issue for MDAS is the regional impact of the placement of an even larger body of water in an area which was formerly grassland and oak woodland. New species such as Bald eagle, Osprey and various gull species are now being seen at the reservoir. We suspect that these and other new residents may have impacts on endemic species, and we anticipate that a larger reservoir would exacerbate these impacts.

Mt. Diablo Audubon Society is very interested in following the progress of the proposed reservoir expansion. Please add MDAS to your mailing list for all future documents and notices for public meetings concerning this issue. In order to expedite the information, please use the following address:

Mt. Diablo Audubon Society
Conservation Committee
1091 Walker Avenue
Walnut Creek, CA 94596

Thank you for your consideration in this matter.

Sincerely,

Michael R. Williams

Michael R. Williams
President

Cc: Ms. Patricia Roberson, Project Manager
Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825-1898
Fax: (916) 978-5094

Seth Adams
Save Mt. Diablo
1901 Olympic Blvd., Suite 220
Walnut Creek, CA 94596
Fax: (925) 947-0642

EAST BAY REGIONAL PARKS PARK DISTRICT

February 21, 2006

Mr. Greg Gartrell
Assistant General Manager
Contra Costa Water District
P.O. Box H2O
Concord, CA 94524

Subject: Scoping Comments for EIR/EIS on proposed Los Vaqueros Reservoir Expansion

Dear Greg:

Thank you for providing East Bay Regional Park District ("District") with the Notice of Preparation for the proposed Los Vaqueros Reservoir Expansion. The District has participated over the past few years in a number of customer feedback meetings conducted by CCWD and CALFED at which we have provided both verbal and written comments about the proposed reservoir expansion. In reviewing the subject NOP, it appears that relatively little has changed in the proposed project description that addresses the concerns and questions previously raised by the District.

Ours comments and concerns focus on how the proposed reservoir expansion and supporting facilities development may affect existing and proposed park and trail facilities adjacent to the Los Vaqueros Watershed. We are also concerned about project impacts to District facilities that may be affected by proposed changes to the South Bay Aqueduct System and our water-oriented recreational facilities that depend upon that system. The following is a summary of our key potential concerns that should be addressed in the Draft EIR/EIS for the proposed project:

- of existing roads, trails and other recreational facilities;
- Loss of up to 1,960 acres of open space and existing mitigation sites;
- Conflicts with the East Contra Costa Habitat Conservation Plan;
- Loss of special-status species habitats;
- Disruption of wildlife migration corridors;
- Disruption of sensitive cultural and historical resources;
- Loss of reliable water supply for water-oriented recreation at other reservoirs; and
- Water quality standard changes affecting existing water-contact recreation at other reservoirs.

Please call me at (510) 544-2622 should you have any questions regarding the attached letter.

Sincerely,

Brad Olson
Environmental Programs Manager

Attachments (2)

cc, EBRPD Board of Directors (w/out attachments)
Pat O'Brien, General Manager
Robert Doyle, Assistant General Manager
Patricia Roberson, Bureau of Reclamation

FEB 2006
RECEIVED
CONTRA COSTA WATER DISTRICT
CALFED

2950 Peralta Oaks Court P.O. Box 5381 Oakland, CA 94605-0381
TEL 510 635-0135 FAX 510 569-4319 TDD 510 633-0460 www.ebparks.org

Scoping Comments on the Proposed Los Vaqueros Reservoir Expansion

February 21, 2006

The District has been acquiring and developing park and trail facilities in the vicinity of the existing Los Vaqueros Watershed for nearly three decades, starting with the 970-acre Smith property at Morgan Territory in 1975. We currently operate four regional parks adjacent to the Los Vaqueros Watershed, including the 4,547-acre Morgan Territory Regional Preserve, 1,910-acre Round Valley Regional Preserve, 1,339-acre Vasco Caves Regional Preserve and the 1,833-acre Brushy Peak Regional Preserve. With the addition of the 4,000-acre Cowell Ranch in 2003, the amount of public lands adjacent to the Los Vaqueros Watershed has effectively doubled since approval of the original Los Vaqueros Reservoir. These 13,629 acres of adjacent public lands and more than 2,000 acres of private lands under conservation easement represent a significant change in the environmental setting of the area. These changed circumstances will need thorough consideration in the EIR/EIS for the proposed reservoir expansion. We have identified the following questions and concerns that need to be addressed regarding potential impacts to these adjacent protected lands:

1. *How will a reservoir expansion affect existing and proposed recreational uses in the watershed and adjacent public lands?*

There are a number of existing public trails, which run through the watershed and adjacent areas. Some of these trails may need to be relocated due to the reservoir expansion. This includes trails that connect with Morgan Territory and Round Valley. We are concerned about the increased regulatory burden and difficulty of relocating such trails into habitat for the Alameda whipsnake, California red-legged frog, California tiger salamander and San Joaquin kit fox. It has been our experience that regulatory agencies are placing substantial restrictions on the location and permitted uses of similar trails in or near endangered species habitats. Such restrictions may include no dogs, no overnight camping or no mountain bikes in areas where such uses are presently allowed. These restrictions are difficult and expensive to enforce, and ultimately may prevent successful implementation of public access mitigation measures. They will also result in increased operating costs for the District to implement and enforce. The proposed expansion project must include provide for these essential recreational uses, fully mitigate their potential effects on biological resources and fund increased law enforcement, operational and monitoring costs.

Another significant District concern is the absence of trails that allow for mountain bicycles and equestrians within those portions of the Los Vaqueros Watershed that contribute runoff into the reservoir. CCWD previously determined not to provide for these uses due to concerns over potential impacts to water quality. We are not aware of any credible scientific research that documents these impacts or justifies exclusion of these uses within the watershed area. The existing watershed includes paved public roads and graveled non-public roads where motor vehicles routinely operate. CCWD also currently has wind turbine leases within the Watershed. Roads and turbines pose a much greater risk to water quality than bicyclists and equestrians. If the proposed reservoir expansion is to receive public funds it must allow for the full range of public access uses within the watershed, including equestrians and bicyclists. Such uses are currently allowed within other publicly funded drinking water reservoirs, including San Pablo, Lafayette, Del Valle and Contra Loma Reservoirs. Exclusion of certain user groups based upon scientifically unfounded impacts to water quality results in other environmental impacts that may be considered significant under NEPA provisions for Environmental Justice. Such impacts must be addressed and fully mitigated in the EIS for this project.

2. *How will the reservoir expansion affect existing mitigation lands and properties subject to Conservation Easements in the watershed and adjacent protected lands?*

As part of its permit conditions for the original Los Vaqueros Reservoir, CCWD was required to place conservation easements over a few thousand acres of mitigation lands within the Los Vaqueros Watershed. CCWD has not provided mapping of these easements that would illustrate which would be impacted by the proposed expansion project. Conservation Easements are intended to be permanent deed restrictions placed on property that prevent incompatible land uses. Surely flooding, filling or grading of easement areas would be an incompatible use. Such an action would effectively extinguish the conservation values of these mitigation lands and threaten the viability of conservation easements as a valuable land conservation tool on a State-wide basis. It is also unclear if CCWD or the Bureau of Reclamation (BOR) has the legal authority to revoke or override these restrictions or to transfer these restrictions to other properties. The EIR/EIS must address this conflict between long-standing State laws and the impacts of the proposed project.

The District has acquired a number of parcels of land using mitigation funding. This includes about 700 acres at Brushy Peak, 400 acres at Vasco Caves and 480 acres at Morgan Territory that are subject to mitigation requirements and/or conservation easements. The conservation easements are held by the Department of Fish and Game, specifically for the conservation of red-legged frog, tiger salamander and kit fox. Using mitigation funding, the District has acquired significant lands which are subject to mitigation requirements and/or conservation easements. The easements are held by the Department of Fish and Game, specifically for the conservation of red-legged frog, tiger salamander and kit fox. If CCWD were successful in "breaking" conservation easements, this precedent could adversely affect the District's ability to protect these special resources in the event that another public agency wished to take District land for an incompatible purpose. The EIR/EIS must address this potential threat to other protected lands.

3. *How will the reservoir expansion affect special-status species and wildlife corridors in the watershed and adjacent public lands?*

The proposed reservoir expansion is particularly a concern for highly mobile species, such as San Joaquin kit fox, which uses and migrates across grassland habitats within and outside the watershed. Disruption of grassland habitats within the watershed may adversely affect the long-term viability of kit fox in grassland habitats outside the watershed. Such disruption would include loss of habitat by reservoir inundation and construction of reservoir facilities, plus the fragmentation and isolation of grassland habitats that result from this inundation. It appears that an increase in the reservoir to 500,000 acre-feet would inundate an additional 1,960 acres of habitat, primarily grassland and oak savanna, both of which are used by kit fox. The western boundary of the proposed reservoir expansion may effectively sever the grassland connection that presently exists along the western side of the reservoir. With loss of this connection, kit fox habitats to the north at Round Valley effectively become isolated by the expanded reservoir foot print. This would also force more of the kit fox movement towards Vasco Road where the potential for road kill would significantly increase.

Another area of concern would be disruption of riparian corridors and seasonal drainages that act as dispersal corridors between the Los Vaqueros Watershed and protected habitats in non-watershed public lands. Red-legged frogs and tiger salamanders are both known to disperse one to two miles from breeding locations to aestivation sites or other waterbodies. There are a number of natural and constructed breeding ponds and drainages within adjacent parklands (and protected private property) that contain large populations of these native amphibians that could be impacted by the loss of migratory and dispersal corridors between District lands and habitats within the watershed. In addition, the reservoir itself provides habitat for bullfrogs and predatory fish. Expansion of the reservoir will increase habitat for these species and potential for disbursement into breeding habitats in adjacent protected land where they would prey upon red-legged frogs and tiger salamanders. The District will experience increased costs to manage our lands to identify and remove such predators. The proposed expansion project needs to fully mitigate these impacts and fund increased stewardship and operational costs.

4. *How will the proposed reservoir expansion affect the proposed preserve design for the East Contra Costa County Habitat Conservation Plan (HCP)?*

The EIR/EIS must address and fully mitigate potential adverse effects of the proposed reservoir expansion on the proposed HCP, which will likely be approved and implemented before a draft EIR/EIS for the subject project is available. There are at least two areas where there is potential conflict between the HCP and the proposed reservoir expansion. These are 1.) the HCP preserve design assumes that a viable movement corridor for kit fox will remain on the west side of the reservoir; and 2.) the acquisition of mitigation lands for the reservoir may compete with the acquisitions being conducted for the HCP. Each of these concerns is addressed below.

> <u>Kit Fox Corridor</u>: The HCP identified four kit fox movement corridors through the HCP preserve area. These are from north to south, 1.) Sand Creek Valley; 2.) Deer Valley; 3.) Briones Valley; and 4.) Los Vaqueros Watershed, on the west side of the existing reservoir. Currently, there are major development proposals for Sand Creek Valley and Deer Valley that threatened these movement corridors. The Briones Valley is also threatened by ranchette subdivisions. This may leave the west side of the existing Los Vaqueros Reservoir as the only protected kit fox movement corridor. This corridor would also be flooded by a reservoir expansion.
>
> <u>Competition for mitigation lands:</u> There is a finite supply of land suitable for mitigation in eastern Contra Costa County. CCWD's planned expansion will compete directly with

the HCP for this scarce resource. Once of the tenets of the HCP is that mitigation lands be purchased from willing sellers, whereas there is currently no such requirement for the proposed reservoir expansion. CCWD exercised its power of eminent domain in acquiring significant portions of the existing Los Vaqueros Watershed. Condemnations often result in settlements or jury awards which substantially exceed fair market value. The net effect of this competition will be to drive land prices higher, making it considerably more difficult for the HCP to achieve its acquisition goals.

5. *How will the reservoir expansion affect sensitive cultural and historical resources in the watershed and adjacent public lands?*

The District has a number of sensitive cultural and historical resources within parklands adjacent to the watershed. These include Morgan Territory, Round Valley, Vasco Caves and Brushy Peak. The later two preserves being particularly important for their spectacular rock outcrops, rock petroglyphs, bedrock mortors and burial sites. Vasco Caves was originally acquired to a large degree to protect these sensitive cultural resources from vandalism and theft as a mitigation measure for the original reservoir project. The proposed reservoir expansion would likely bring watershed visitors within closer proximity to these sensitive resources, subjecting them to increased risk of vandalism and theft. Accordingly, there will be an increased need for security, in the form of signage, fencing and police patrols. There will also be an increased need for public education to protect these areas. The proposed expansion project needs to fully mitigate and fund these increased security and operational costs.

6. *How will proposed changes in the operation of Los Vaqueros Reservoir affect other existing reservoirs that are part of the South Bay Aqueduct System?*

As you are aware, the District has a number of other water-oriented recreation facilities that are dependent upon a regular supply of surface water from the South Bay Aqueduct. These include the 4,311-acre Del Valle State Recreation Area, 266-acre Shadow Cliffs Regional Recreation Area and potential District management of Bethany Reservoir State Recreation Area.

We currently operate Del Valle Recreation Area on behalf of the Department of Parks and Recreation. This is the District's largest and most popular water-contact reservoir, with an annual visitation in excess of 500,000 people. This reservoir is dependent upon the South Bay Aqueduct as its primary source of fresh water. Any change in the operation of this reservoir as a result of changes in the operation of the SBA could have significant impacts to swimming, fishing and boating at Del Valle Reservoir. This potentially significant effect must be addressed and fully mitigated in the EIR/EIS.

Downstream from Del Valle Reservoir are the District's Camp Arroyo and Shadow Cliffs Recreation Areas. These facilities are dependent upon water releases from Del Valle Reservoir to provide adequate flows and water supply for fishing, swimming and boating, as permitted. Project-related changes to operation of Del Valle Reservoir could adversely affect these facilities. This potentially significant effect must be addressed and fully mitigated in the EIR/EIS.

7. *How will proposed delivery of Los Vaqueros Reservoir water to the South Bay Aqueduct System affect water quality standards at existing reservoirs?*

Recent District experiences at Contra Loma Reservoir and other locations have demonstrated that changes in water quality standards based upon changes in reservoir operations can have an adverse impact on water-contact recreation, especially swimming and wind surfing. We are concerned that should there be a tie in between Los Vaqueros Reservoir and other existing reservoirs in the South Bay Aqueduct System, there may be changes in the water quality standards that adversely affect existing water contact recreation at Del Valle and Bethany Reservoir, and potentially at Camp Arroyo and Shadow Cliffs. This potentially significant effect must be addressed and fully mitigated in the EIR/EIS.

8. *How would construction of either the Los Vaqueros-South Bay Aqueduct Gravity Pipeline or the Los Vaqueros-South Bay Aqueduct Pump Station and Pipeline avoid impacts to Vasco Caves and Brushy Peak?*

It appears from Figure 2 in the NOP that the proposed pipeline routes from Los Vaqueros to the South Bay Aqueduct would cross through or adjacent to Vasco Caves Regional Preserve, Brushy Peak Regional Preserve, or other private mitigation lands north of Vasco Caves or east of Vasco Road. As previously noted, these two District preserves contain a number of sensitive natural and cultural resources that could be adversely affected by a pipeline project. In addition, large portions of these preserves are also subject to conservation easements, which prohibit the construction of pipelines. Without more specific information on the proposed routing of these pipelines, it is not possible to precisely determine what, if any, types of impacts could occur. The EIR/EIS should provide more specific information and detailed mapping of proposed pipeline routes so that the impacts of proposed pipelines can be identified and fully mitigated. Additional pipeline routes must also be considered in the EIR/EIS that avoid protected public and private lands in the area.

9. *Will CCWD, BOR or CALFED consider the development of trails and other recreational facilities along proposed pipeline corridors?*

The NOP doesn't address new recreational opportunities that can be provided with development of new or expanded pipeline corridors. The proposed pipeline from Los Vaqueros to the South Bay Aqueduct could present a good opportunity to develop a multi-use regional trail within the proposed right-of-way. Expansion of the Old River pumping plant and pipeline corridor to Los Vaqueros is another opportunity to provide for a trail from the Delta to Los Vaqueros. Some of these examples may be one way to mitigate the loss of existing trail connections in other areas.

10. *Will the proposed reservoir expansion accomplish its stated project objectives if there are significant levee failures in the Delta?*

Recent studies have shown that the Delta levees are in very poor condition and may not withstand a major earthquake or the effects of sea level rise. Failure of levees will adversely affect Delta water quality by allowing salt water intrusion, and increase turbidity and contamination from flooded Delta islands. The EIR/EIS should address the potential for levee failure to adversely affect the existing and expanded reservoir water supply reliability and water quality goals. Accordingly, the EIR/EIS should evaluate a number of project alternatives that focus instead upon Delta levee repairs and water conservation measures instead of a reservoir expansion. Given recent flooding events in the southeastern United States, it would appear prudent for Delta levee repairs to be accomplished before there is any further consideration of expensive reservoir expansions that may not be able to accomplish their stated objectives due to Delta levee failures. These questions should be addressed in the economic impact analysis section of the EIS.

As discussed above, increasing the number of lanes on Vasco Road will increase the existing barrier and hazard to wildlife movement across the entire southeastern portion of the inventory area. Approximately doubling the road width will reduce the effectiveness of the wildlife tunnels and reduce the ability of wildlife to cross the road safely.

4.3.4 Effects of Activities in HCP/NCCP Preserves

In almost all cases, activities within the Preserve System are designed to enhance and augment covered communities, wetlands, and streams. Overall, any detrimental effects on these land-cover types are expected to be negligible relative to the benefits of the conservation strategy. Construction of limited recreational facilities (e.g., trails, parking areas) and management facilities (e.g., field offices, access roads) is expected to have a total footprint within the Preserve System of no more than 50 acres. Much of this footprint would occur on land already disturbed, and would have negligible effects on natural land cover.

4.4 Effects on Covered Species

This section describes the potential direct and indirect effects on covered species under the Plan. The major direct effects will result from habitat loss associated with urban development. Because this Plan utilizes a habitat-based approach, the determination of direct and indirect effects on covered species is based on the habitat disturbed for each species. Table 3-10 and the species profiles (Appendix D) provide additional information on specific biological needs for each covered species. Examples of overlays of habitat models with the permit area are shown in Figures 4-1 through 4-4. Impacts are described below for each taxonomic group. Estimates of impacts on covered species with habitat models are provided in Tables 4-4 and 4-5 under the initial and maximum urban development areas, respectively.

4.4.1 Mammals

Two mammals are covered by the Plan: Townsend's western big-eared bat and San Joaquin kit fox. Few recent sightings of the bat have been reported, and there are no published records of Townsend's western big-eared bat within Contra Costa County. However, the species likely roosts in the inventory area in suitable abandoned mines, abandoned buildings, and caves. At least two mines exist in the inventory area (Black Diamond Mines and mines within Antioch adjacent to Black Diamond Mines Regional Park), but it is unknown if Townsend's western big-eared bat occurs in them. Covered activities are not anticipated to directly affect these habitat features. However, if abandoned mines are incorporated into the Preserve System, mine stabilization may be needed for safety; stabilization measures may result in take of Townsend's western big-eared bat is this species occupies those sites. Similarly, stabilization of old buildings in the Preserve System occupied by bats may result in direct or indirect impacts to this species. Indirect impacts (Table 4-1), such as increased harassment or disturbance due to overall population growth or recreation within the preserves, may affect small numbers of individual bats that roost in buildings, bridges, or other structures within the inventory area. Although habitat for this species was not modeled, the loss of up to 4,363 acres of annual grassland and 263 acres of wetlands and wetland complexes would reduce available foraging habitat for this species.

Within the inventory area, core habitat for San Joaquin kit fox is defined as annual grassland, alkali grassland, and oak savanna contiguous with grassland. Secondary foraging habitat occurs in agricultural fields and row crops. Because habitat fragmentation is a significant threat to kit fox, preservation of contiguous habitat is of primary importance. Ideally, contiguous habitat would be preserved that is wide enough to serve both as local foraging and breeding habitat (i.e., support one or more kit fox home ranges) and as regional movement habitat. The inventory area represents the northernmost extension of the species' range, so maintaining connectivity to Alameda County to the south is critical to maintaining the species in the inventory area. Within the inventory area, four major movement routes, trending northwest-southeast, are thought to link known occurrences in Black Diamond Mines Regional Park to the portions of its range in southern Contra Costa County (see Figure 5-5 and further discussion in Chapter 5). The southward expansion of Pittsburg and Brentwood would affect small portions of core habitat for kit fox, while growth of Byron and infill in Brentwood would affect small portions of habitat defined as low use in the HCP/NCCP model. The expansion of the Byron Airport would affect core habitat for this species. The westward expansion of Pittsburg would affect areas modeled as core habitat for kit fox, but this area may be outside the species' range. Overall, approximately 5,000 acres of core kit fox habitat have the potential to be affected by covered activities under the maximum urban development area relative to a total of approximately 64,000 acres of habitat throughout the inventory area (less than 8%) (Tables 4-4 and 4-5; Figure 4-1).

Although not a covered activity, the expansion of Antioch to the south has the potential to significantly impair a primary movement route through the Sand Creek and Lone Tree Valleys. The expansion of the Los Vaqueros Reservoir will also eliminate core habitat for this species and reduce movement routes. These impacts are discussed in Section 4.6, *Cumulative Impacts*.

Numerous indirect effects resulting from human population growth and increased urbanization have the potential to affect kit fox along the urban-wildland interface (Table 4-1). The Vasco Road Widening project will remove core habitat for kit fox and has the potential to substantially reduce its movement from Alameda County into Contra Costa County. Recreational use on HCP/NCCP preserves that support active kit fox home ranges will be prohibited or limited to avoid or minimize adverse impacts on the species. Increased risk of fire

California Regional Water Quality Control Board

Central Valley Region

Robert Schneider, Chair

Alan C. Lloyd, Ph.D.
Agency Secretary

Sacramento Main Office
11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Arnold Schwarzenegger
Governor

27 February 2006

Ms. Marguerite Naillon, Project manager
Contra Costa Water District
Post Office H2O
Concord, CA 94250

COMMENTS ON THE NOTICE OF PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT FOR THE LOS VAQUEROS RESERVOIR EXPANSION PROJECT, CONTRA COSTA COUNTY

Thank you for the opportunity to provide comments on your proposal to construct additional screened intakes at Old River, a new Sacramento-San Joaquin Delta (Delta) pump station, pipelines to connect the current and new Delta intakes to the new Delta pump station, a pipeline to deliver water from the Delta pump station to the expanded reservoir, a dam modification or replacement, and reservoir expansion.

Our comments are provided regarding the potential impacts on dissolved oxygen (DO) in the Delta and regulatory requirements for the proposed alternatives. The EIR will need to address the potential DO impacts for all proposed activities within the Delta and the regulatory requirements for the proposed activities.

DISSOLVED OXYGEN BACKGROUND

Several water bodies within the boundaries of the Delta have been included on the State Water Board's CWA Section 303(d) list as impaired due to low DO conditions. In January 2005, the Central Valley Water Board adopted *Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control Program for Factors Contributing to the Dissolved Oxygen Impairment in the Stockton Deep Water Ship Channel* (DO Control Program). In November 2005, the State Water Board approved the DO Control Program with minor modifications. The DO Control Program identifies reduced San Joaquin River flow through the San Joaquin River Deep Water Ship Channel (DWSC) as a major contributor to the DO impairment. It also recommends to agencies responsible for existing and future water resources facilities, which impact or have the potential to impact flow through the DWSC, that they evaluate and reduce their impacts on the DO impairment in the DWSC.

In 2002 the State Water Board adopted a revised 303(d) list of impaired water bodies. This list included DO impairments on Old River and Middle River within the Delta. Although the Central Valley Water Board has not yet developed control programs for these impairments, the EIR will need to evaluate and mitigate the potential impacts of the proposed alternatives on these water bodies.

REGULATORY REQUIREMENTS

CWA Section 401 Water Quality Certification
Any project that involves dredge or fill in waters of the US will require a CWA Section 404 permit from the U.S. Army Corps of Engineers. As part of this process, the Regional Water Board must issue a CWA Section 401 Certification that the proposed project will meet applicable water quality standards. To support a Water Quality Certification, the EIR would need to address the DO related comments above as well as other water quality issues. For dredging operations, the material to be dredged must be adequately characterized and the information on the disposal locations disclosed. More information may be found at www.waterboards.ca.gov/centralvalley/programs/wqcert/401cert-overview.pdf.

NPDES General Permit for Storm Water Discharges Associated with Construction Activities, NPDES No. CAS000002, Order No. 99-08-DWQ
Any project that involves activities where clearing, grading, disturbances to the ground, such as stockpiling or excavation results in land disturbance of one or more acres or pose a threat to water quality will require coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction Activities. Construction activity that involves soil disturbance on sites of less than one acre but is part of a larger common plan of development must also permit coverage. More information may be found at www.waterboards.ca.gov/stormwtr/construction.html.

If there are any questions regarding the dissolved oxygen comments, please contact Les Grober by e-mail at lgrober@waterboards.ca.gov or by phone at 916-464-4851. If there are any questions regarding the regulatory requirement comments, please contact Sue McConnell by phone at 916-464-4798 or by e-mail at smcconnell@waterboards.ca.gov.

William J. Marshall

WILLIAM J. MARSHALL
Chief, Storm Water Section

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STATE OF CALIFORNIA—THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, *Governor*

DELTA PROTECTION COMMISSION
14215 RIVER ROAD
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WALNUT GROVE, CA 95690
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February 24, 2006

Marguerite Naillon
Contra Costa Water District
P.O. Box H20
Concord, California 94524-2099

Subject: Notice of Preparation (NOP) for the Los Vaqueros Reservoir Expansion Project (SCH #2006012037)

Dear Ms Naillon:

The staff of the Delta Protection Commission (Commission) has reviewed the subject NOP dated January 10, 2006. From the information provided, a determination has been made that components of the proposed project would be located in the Secondary Zone of the Legal Delta. Therefore, actions for approval or denial are not subject to appeal to the Commission. However, any potential impacts to the resources of the Primary Zone of the Legal Delta resulting from activities in the Secondary Zone and outside of the Delta should be identified and analyzed pursuant to the requirements of the California Environmental Quality Act (CEQA). Therefore, the following comments are provided for consideration during the environmental review and project approval process.

The Delta Protection Act (Act) was enacted in 1992 in recognition of the increasing threats to the resources of the Primary Zone of the Delta from urban and suburban encroachment having the potential to impact agriculture, wildlife habitat, and recreation uses. Pursuant to the Act, a Land Use and Resource Management Plan (Management Plan) for the Primary Zone was completed and adopted by the Commission in 1995 (updated in 2002).

The Management Plan sets out findings, policies, and recommendations resulting from background studies in the areas of environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees, and marine patrol/boater education/safety programs. As mandated by the Act, the policies of the Management Plan are incorporated in the General Plans of local entities having jurisdiction within the Primary Zone, including Contra Costa County. The Act and Management Plan are available at the Commission's website, www.delta.ca.gov. Sections of the Management Plan that are applicable to this proposal include: Utilities and Infrastructure (Policy 1); Land Use (Policy 3 and Recommendation 5); Water (Policies 1 and 3 and Recommendations 2, 3, 6, 7, and 8); Recreation and Access (Recommendations 3 and 6).

Marguerite Naillon
February 24, 2006
Page Two

In addition, there are several general areas that should be covered in the CEQA analysis for this project.

- It should be demonstrated that the quality and quantity of water available for Delta water users would not be significantly impacted;
- Potential cumulative impacts of additional pumping from Delta channels, given other pumping related projects and known proposals, should be taken into consideration; and
- Potential impacts of new pumps, pumping stations, and pipelines proposed as a part of the project to be located in the Secondary Zone, having the potential to impact the Primary Zone, should be analyzed.

Thank you for the opportunity to provide some input into the scoping process for this project. Please continue to send me information on the project as the review process progresses. You may contact me at (916) 776-2291 or loridpc@citlink.net if you have any questions about the Commission or the contents of this letter.

Sincerely,

Lori Clam

Lori Clamurro
Environmental Scientist

cc: Scott Morgan, State Clearinghouse

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February 28, 2006

Katherine Osborn
2437 Piedmont Ave. # 109
Berkeley, CA 94704

Marguerite Naillon
Contra Costa Water district
P.O. Box H20
Concord, C 94524-2099

By FAX: 925 686-2187

RE: Comments on the Notice of Preparation for Los Vaqueros Reservoir Expansion Project

Dear Ms. Naillon

Thank you for the opportunity to review the Notice of Preparation for Los Vaqueros Reservoir Expansion Project. I have the following comments.

- It is important that the EIS/EIR prepared by CCWD and the USBR reiterate and continue the environmental commitments made by CCWD and the USBR through certification of the 1993 Los Vaqueros Project EIS/EIR and through adoption of CCWD Board Resolution 88-45. In particular, the CCWD Board commitment to mitigate all adverse environmental effects to a level of insignificance. The environmental analysis for Los Vaqueros Reservoir Expansion should tier from the 1993 Los Vaqueros Project EIS/EIR.

- Mitigation for the Los Vaqueros Project included the construction of wetland, riparian, and oak woodland habitat areas. These in-kind mitigation areas were constructed within the Kellogg Creek watershed and will likely be inundated and destroyed with Los Vaqueros Reservoir Expansion. The environmental issues to be addressed in the EIS/EIR should include the impacts of the alternatives on existing mitigation areas and the feasibility of and additional requirements for in-kind, within watershed mitigation for sensitive species and habitat.

- The environmental issues to be addressed in the EIS/EIR should include the adverse effects on Delta fisheries due to operation of the USBR/CCWD pumping facilities at Old River, Mallard Slough, and Rock Slough. Operational data at the screened Old River pumping facility, the unscreened Mallard Slough pumping facility, and the unscreened Rock Slough pumping facility could be used for this analysis.

Sincerely,

Katherine Osborn

Katherine Osborn

save MOUNT DIABLO

SMD Mailing Address
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Walnut Creek, CA 94596
Tel: (925) 947-3535
Fax: (925) 947-0642

Website:
www.savemountdiablo.org

February 28, 2006

Ms. Marguerite Naillon, Project Manager
Contra Costa Water District
P.O. Box H20
Concord, CA 94524-2099

Subject: Scoping comments for concerning the Los Vaqueros Reservoir Expansion

Dear Marguerite,

Thank you for providing Save Mount Diablo (SMD) with the opportunity to respond to the notice of preparation for the Los Vaqueros reservoir expansion Environmental Impact Report (EIR). SMD is a 7000 member non-profit conservation organization, which acquires land, for addition to parks on and around Mt. Diablo, and monitors land use planning which might affect those parks.

SMD has been involved in the plans for the proposed expansion for since the project was proposed. There are several issues we believe should be considered during any evaluation of the project. The following are a list of some of our concerns about the project:

1) Biological Impacts for communities, invasive species, and special status organisms
2) Population Growth the expansion of the reservoir may induce
3) Legal Issues/Precedent set by the elimination of a conservation easement
4) Recreational Impacts to regional trails and their use
5) Construction and the problems it creates for residents and wildlife in the area
6) Traffic and impacts on local roadways created by the projects expansion

Feel Free to contact me at the address and number listed above if you have any questions regarding our comments.

Sincerely,

Seth Adams

Seth Adams
Director of Land Programs
Save Mount Diablo

1) Biological: The Los Vaqueros Reservoir expansion will inundate several thousand acres of open space in eastern Contra Costa County. The majority of this land is grassland habitat, with some oak woodland, riparian woodland, wetlands, and chaparral. Several biological studies have been done for the watershed, included in the EIR for the creation of the reservoir in the early 1990s, and leading up to the proposal for expansion. A number of sensitive animal species inhabit the watershed or use it as a migration corridor. These species include but are not limited to: California tiger salamander, California red legged frog, burrowing owl, peregrine falcon, San Joaquin kit fox, vernal pool fairy shrimp, alameda whipsnake, and golden eagle.

According to the EIR for the original Los Vaqueros project (7-9) from 1993, 25 special status species have been reported within 5 miles of the project area with potential to occur onsite. In addition to the special status plant species, the natural community of oak woodland occurs in Los Vaqueros. Due to loss of most of its suitable habitat in the Sacramento and Northern San Joaquin this community's continued existence in California is threatened. The EIR should consider the impacts the reservoir expansion will have and what mitigations may be appropriate.

The expansion of the reservoir may increase the numbers of invasive and non-native species. Several migrating and non-native bird species were attracted by the creation of the reservoir and their numbers may increase with expansion. Some predatory fish and non-native bullfrogs present in the reservoir may be able to expand their range and enter the drainage areas for Marsh Creek and other local watersheds, threatening the existence of several endemic species.

--SMD is especially concerned about the precedent of loss of mitigation lands and projects for thje proposed expansion
--We do not believe that the District or regulatory agencies should be contemplating mitigation within the watershed, since it served as mitigation for the first project.
--we believe that new open space lands should be acquired if any project moves forward, and that these open space lands should be local to the project.
--the EIR should include evaluate mitigations from the first project to see whether they have been beneficial or not.
--the EIR should evaluate whether the health of Delta ecology will be sustained or harmed by the project.

2) Population Growth: The expansion of the Los Vaqueros reservoir may have the affect of inducing greater population growth in eastern Alameda and Contra Costa counties. With the increase in water availability in the area, this could increase growth substantially, reducing benefits for current residents.

--the EIR should include analysis as to whether the project will induce growth.

3) Legal Issues/Precedent. A potentially critical impact of the proposed Los Vaqueros expansion would be the elimination of conservation easements placed over resource lands within the watershed. There is no precedent for the proposed action. If a public agency is allowed to eliminate a conservation easement without appropriate compensatory mitigation, this could place a number of properties protected by such easements in danger and remove an important tool for private organizations and public agencies seeking to protect and preserve land.

--apparently CCWD has failed to encumber with conservation easements all the lands required for mitigation in the first project. If this is true, what is the reason for the delay? Is it appropriate to delay mitigation to this extent?

3) Recreational Impacts: One of the goals sought by the EBRPD, SMD, the State Park, and other organizations is the creation of a multi-use Diablo Regional Trail and Diablo Grand Loop Trail that passes through the protected areas of central and eastern Contra Costa County. The Grand Loop/Diablo Trail currently passes through the watershed from Morgan Territory to Round

Valley, the Diablo Trail is intended to eventually follow a route south through the watershed to Brushy Peak Regional Preserve but has been so far stymied by the District's opposition to multi-use trails (bikes and horses) about the reservoir dam.

The expansion of the reservoir will threaten these trail linkages and may require the alteration or elimination of certain sections of the trail. The loss of these recreational benefits should be studied and will need mitigation—how will trail use continue uninterrupted, for example. Other recreational facilities also exist at the reservoir. The construction would necessitate their removal and possible reconstruction elsewhere. This would curtail use of the reservoir by residents for some time and the structural and temporal impacts should be considered.

5) Construction: The expansion plan would require years of construction to take place in the Los Vaqueros area including the removal of the current dam and the construction of a pipeline to carry water from the Delta to the enlarged reservoir, with attendant traffic and construction impacts in a rural/open space environment. The noise, dust and glare created by the project should be evaluated in any EIR for the project.

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ALAMEDA COUNTY WATER DISTRICT
SANTA CLARA VALLEY WATER DISTRICT
ZONE 7 WATER AGENCY

February 28, 2006

Ms. Marguerite Naillon
Project Manager
Contra Costa Water District
P.O. Box H20
Concord, CA 94524

Ms. Patricia Roberson
Project Manager
U.S. Bureau of Reclamation
2800 Cottage Lane
Sacramento, CA 95825

Dear Ms. Naillon and Ms. Roberson:

Subject: Comments on the Notice of Intent and Notice of Preparation for the Los Vaqueros Reservoir Expansion Project EIR/EIS

Thank you for the opportunity to comment on the Notice of Preparation (NOP) and Notice of Intent (NOI) for the Los Vaqueros Reservoir Expansion Project EIR/EIS. As you know, Alameda County Water District (ACWD), Santa Clara Valley Water District (SCVWD) and Zone 7 Water Agency (collectively known as the "South Bay Aqueduct Contractors" or "SBA Contractors") rely on deliveries of State Water Project (SWP) supplies via the South Bay Aqueduct (SBA) to deliver up to 220,000 acre-feet per year to our service areas in Alameda and Santa Clara Counties. This water is treated at our respective water treatment plants prior to distribution for potable use. In addition, a portion of our SWP supplies are also used for local groundwater recharge operations.

As documented in the NOP/NOI, a key component of the proposed Los Vaqueros Reservoir Expansion Project ("Project") is a connection between the Los Vaqueros Reservoir and the South Bay Aqueduct. The NOP/NOI indicates that this connection will be required to deliver water from the expanded Los Vaqueros Reservoir to Bay Area water users. Given the importance of the SBA in delivering SWP supplies to our agencies, and given that the Project would (1) include a new connection to the SBA and (2) introduce water from a new source (i.e the expanded Los Vaqueros Reservoir) into the SBA, the EIR/EIS should address potential effects of the Project on the South Bay Aqueduct and our SWP water supplies. The evaluation of Project effects should include both construction-related activities as well as the subsequent operation of the proposed Project. Specific items that should be evaluated in the EIR/EIS are listed below.

1. Water quality – The EIR/EIS should evaluate any potential changes to water quality in the South Bay Aqueduct as a result of the Project. Constituents to be evaluated should include: bromide, TOC, TDS, turbidity, pH, dissolved oxygen, taste and odor, algae, alkalinity, and temperature. This evaluation should include seasonal changes, as well as changes under a wide range of hydrologic conditions (i.e. critical, dry, below normal, above normal and wet conditions).

2. Water treatment – The EIR/EIS should evaluate the effects that the changed SBA water quality may have on our ability to treat water from the SBA at each of our water treatment plants. Any potential changes in treated water quality, production capacity, and/or treatment costs as a result of the Project should be evaluated. Both ACWD and Zone 7 have conducted preliminary assessments of the Project in terms of impacts to treatment costs at their treatment plants. These assessments were previously transmitted to CCWD and should be considered in the EIR/EIS evaluation.

3. Conveyance capacity – Each of our agencies relies on contracted capacity of the SBA to deliver SWP supplies to our service areas. This capacity is critical to meeting service area demands, especially during peak summer months. The EIR/EIS should evaluate any potential effects that the Project may have on the daily, monthly and annual delivery capacity of the SBA.

4. Water supply reliability – Based on the material provided in the NOP/NOI it is not clear whether the Project would affect the water supply reliability of our SWP supplies in the event that one or more of our agencies chooses not to participate in the Project. The EIR/EIS should evaluate any potential effects that the Project may have on water supply reliability under a wide range of hydrologic conditions (i.e. critical, dry, below normal, above normal and wet conditions) assuming that one or more of our agencies do not participate in the Project.

5. Operations, maintenance and power needs – The EIR/EIS should evaluate the effects that the Project may have on SBA operations, maintenance and power needs and costs.

6. Del Valle Reservoir – The Del Valle Reservoir is part of the State Water Project and operates as a regulatory reservoir for the operation of the South Bay Aqueduct. During some periods of the year water from the SBA is stored in Del Valle Reservoir for later release back into the SBA. In addition, Del Valle also provides storage for ACWD and Zone 7 for local supplies. The EIR/EIS should evaluate any potential effects that the Project may have on existing and planned SWP operations at Del Valle as well as any effects on water quality in the reservoir. The EIR/EIS should also evaluate any potential effects of the Project on ACWD's and Zone 7's use of the reservoir for storage of local supplies.

7. Aquatic species and habitat – Currently, raw water from the SBA is introduced into local watersheds from a variety of mechanisms, including SBA releases to Del Valle Reservoir, releases to local arroyos in the Zone 7 service area for groundwater recharge, releases to creeks within Santa Clara County, and releases into Alameda Creek (via the Vallecitos Turnout) for subsequent ACWD groundwater percolation. Given that the Project would introduce a new source of supply into the SBA, the EIR/EIS should evaluate any potential impacts that this new source of supply may have on habitat and aquatic species in local watersheds.

8. Seismic reliability –The temporary loss of the SBA as a result of a seismic failure may result in significant water supply shortages in our service areas. Given that the Project will construct new conveyance facilities and connection to the SBA, the EIR/EIS should evaluate the potential effects that these new facilities would have on the seismic reliability and potential for outages as a result of a major earthquake in the Bay Area.

9. Delivery reliability – The SBA is subject to periodic planned and unplanned outages for maintenance and other needs. While our agencies can typically accommodate infrequent and short term planned outages, any increase in the frequency and/or duration of outages may have significant impacts on our water supply operations. The EIR/EIS should evaluate the potential for planned and unplanned outages of the SBA that may occur as a result of the Project.

Contra Costa Water District and the USBR should coordinate closely with the DWR (State Water Project Analysis Office) and each of the SBA Contractors in the evaluation of these potential Project effects. Coordination with our agencies will also be critical in establishing the appropriate criteria for the determination of the level of significance of adverse impacts. The EIR/EIS should also include commitments to sufficient mitigation and monitoring such that any resulting adverse impacts to the SBA and our water supplies are less than significant.

We look forward to continue working with CCWD and the USBR on this Project, and would like to thank you again for the opportunity to comment on the NOP/NOI.

Sincerely,

Paul Piraino

Paul Piraino
General Manager
Alameda County Water District

Stanley M. Williams

Stanley M. Williams
CEO
Santa Clara Valley Water District

Dale Myers

Dale Myers
General Manager
Zone 7 Water Agency

ec
By e-mail
cc: Steve Cimperman, Department of Water Resources
Terry Erlewine, State Water Contractors

STATE OF CALIFORNIA, RESOURCES AGENCY ARNOLD SCHWARZENEGGER, GOVERNOR

CALIFORNIA CONSERVATION

DEPARTMENT OF CONSERVATION

DIVISION OF LAND RESOURCE PROTECTION

801 K STREET • MS 18-01 • SACRAMENTO, CALIFORNIA 95814

PHONE 916 / 324-0850 • FAX 916 / 327-3430 • TDD 916 / 324-2555 • WEB SITE conservation.ca.gov

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CONTRA COSTA WATER DISTRICT
CALFED

February 27, 2006

Ms. Marguerite Naillon
Los Vaqueros Reservoir Expansion Project Manager
Contra Costa Water District
P.O. Box H20
Concord CA 94250

Subject: Notice of Preparation (NOP) for the Los Vaqueros Reservoir Expansion Draft Environmental Impact Statement/Report, Contra Costa County

Dear Ms. Naillon:

The Department of Conservation's Division of Land Resource Protection (Division) monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act, California Farmland Conservancy Program, and other agricultural land conservation programs.

Contra Costa Water District and the U.S. Bureau of Reclamation are acting jointly as lead agencies under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) in preparation of a draft environmental impact report/statement (DEIR/S) for the expansion of the Los Vaqueros Reservoir. This project is included in the California Bay Delta program's long-term planning documents. The objectives of the proposed project involve improving water supplies for environmental programs such as the Environmental Water Account program, increasing water supply reliability by increasing the capacity of the reservoir, and improving water quality. The current reservoir facility consists of a storage reservoir behind a 200-foot high dam, over 18 miles of pipeline, and two pump stations. The expanded reservoir would be operated similarly to the existing reservoir, however, additional screened intakes, a new pump station, and additional pipelines would be constructed.

We offer the following comments, and respectfully ask that our concerns be addressed in the DEIR/S:

The NOP indicates that the expansion project could potentially affect agricultural resources. We ask that the DEIR/S provide a detailed discussion of whether any agricultural lands would be acquired and if termination of Williamson Act contracts would result in order to accommodate the proposed project. It should also further discuss whether such Williamson Act contract termination would affect any nearby agricultural acreages, as well as those properties under contract. If any part of the project's site is under Williamson Act contract, and any part of the project site is to continue under contract after project completion, the document should discuss the proposed uses for those lands. Uses of contracted land must meet compatibility standards identified in Government Code Sections 51238 - 51238.3; otherwise, contract termination (see paragraph above) must occur prior to the initiation of the project.

We respectfully request that the Division's Land Evaluation Site Assessment model be utilized to determine significance of impact resulting from conversion of agricultural resources to other uses. The model and instructions is available on the Department's website at www.conservation.ca.gov. (Click on the Division of Land Resource Protection link, followed by the link at the right of the screen for the LESA model.) We would be pleased to assist the lead agencies in its use.

Please note that any acquisition of contracted land by a public agency must meet the requirements set forth in Government Code sections 51290 to 51295. Specific findings would need to be reported to the Department of Conservation in the required notice to the Director. The requirements for findings may be waived under Government Code section 15993 (h).

Thank you for the opportunity to review this document. We look forward to reviewing the DEIR/S. Please contact Jeannie Blakeslee at (916) 323-4943 if you have any questions regarding these comments.

Sincerely,

Dennis J. O'Bryant

Dennis J. O'Bryant
Acting Assistant Director

TOWN OF DISCOVERY BAY CSD

FEB 2006
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CONTRA COSTA WATER DISTRICT
CALFED

1800 Willow Lake Road, Discovery Bay, CA 94514
Telephone: (925) 634-1131 Fax: (925) 513-2705

February 16, 2006

Ms. Marguerite Naillon, Project Manager
Contra Costa Water District
P.O. Box H20
Concord, CA 94250

RE: Town of Discovery Bay, Community Services District (CSD) Comments on the Notice of Preparation (NOP) for an Environmental Impact Report (EIR) on the Proposed Los Vaqueros Reservoir Expansion Project

Dear Ms. Naillon:

The Board of Directors of the Town of Discovery Bay CSD at its regular meeting on Wednesday, January 18, 2006 discussed the Notice of Preparation (NOP) for an Environmental Impact Report (EIR) on the Proposed Los Vaqueros Reservoir Expansion Project and has the following comments:

1. On page 8 of the NOP, under "Required Facilities – Delta Intakes", the total intake for your proposed project is five to seven times more than what is currently being pumped today. This may alter the flow of our effluent from our wastewater discharge pipeline, which is about 400-500 feet south of Contra Costa Water District's (CCWD) Old River pump station. The Town is extremely concerned about the possible effect of alteration of the flow that your project may have on our diffuser pipe. The possible effect will need to be analyzed thoroughly, and any potential need for alteration of, or work on, the Town's diffuser will need to be discussed, with an emphasis on the source of financing, if any.
2. The Town of Discovery Bay CSD Board would like to know the location(s) of the proposed "Delta Pump Station".
3. Under "Delta-Los Vaqueros (Delta-LV) Pipeline" which talks about either a single or double parallel pipeline(s), of which may be constructed next to CCWD's existing intake pipeline, you should be aware that this may become an issue for the Town for two (2) reasons. One would be that the driveway to access the Town's wastewater treatment facility needs to be accessible 24-hours a day. The second would be the construction of this very long pipeline(s) will have an impact on the residents of Discovery Bay because of the dust, noise, and delays or detours for a few years with no benefit to our 15,000 +/- residents.

4. The Town feels that the egress and ingress of the construction equipment and their material suppliers will have a major impact to the users of Highway 4 and some of the other narrow roads, which may cause vehicle accidents along with the mud and dust on the roads and in our homes.
5. Most of Discovery Bay is surrounded by a levee, which is meant to help protect our 5,300 +/- homes from flooding and has a total appraised value of about $2-3 billion. It is also possible that either the current reservoir or the new proposed reservoir when built may cause a major impact to the Byron, Brentwood, and Discovery Bay communities. If either the current or proposed reservoir were to somehow fail, causing widespread flooding from the landside, these same levees will prevent the floodwaters from returning to the delta. These levees are designed to hold back the waters of the Delta but not water from the landside. Prolonged flooding from the landside would weaken these levees to a point where they could fail during periods of high tides and high water in the river. These communities need to have and be part of a community wide emergency evacuation plan. We would look to CCWD to insist that the County work these plans into the County Emergency Plan.
6. The current Los Vaqueros Watershed Recreational Facilities is accessible with little or no fees by CCWD's customers and with a fee by all other non-CCWD customers. Since Brentwood residents are a customer of CCWD, and Byron and Discovery Bay are not, and the residents of these two communities are the ones being impacted by the years of construction, noise, dust and traffic delays, we would like to suggest that the residents of Zip-code 94513 & 94514 be allowed to access the Los Vaqueros Watershed Recreational Facilities with no fees.
7. On page 12 of the NOP, it outlines a "Comparison" chart of total acreage, but there is nothing mentioned about the total number of additional cubic feet of fill that will be needed to either construct a 300,000-acre-foot or a 500,000-acre-foot reservoir. Also needed are where this fill is coming from, and the volume that is needed.
8. In this NOP, it does not seem to describe where the source of the electrical power is coming from for the proposed pump station, or where the route would be for the electrical power poles / towers.
9. On the south side of the intersection of Discovery Bay Boulevard and Highway 4, is an existing CCWD pipeline structure. We believe this structure is used as an air-relief device. Looking towards the future, it seems that if Discovery Bay was to extend Discovery Bay Boulevard to the South, this concrete structure would be in the way. With the new proposed pipeline, we would prefer that there be no pipeline above ground structures built in this area.

We would like to ask that these concerns of the Town be addressed by the project's EIS/EIR document. Should you have any questions on these items, please contact Virgil Koehne the District's General Manager at (925) 634-1131.

Sincerely,

Robert Doran

Robert Doran, Board President
Town of Discovery Bay CSD

VK/ca

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COMMENTS TO CALFED ON THE PROPOSED EXPANSION OF THE LOS VAQUEROS RESERVOIR,

January 24, 2006

My comments today are focused on the impacts on the Vasco Caves, but I want to be clear that this by no means is the only impact the expansion of the Los Vaqueros Reservoir (LVR) would have on the areas biological and cultural resources. I have just chosen to comment on the most flagrant and measurable destructive consequence the enlargement of LVR will have.

I have been visiting the Vasco Caves since 1987 when they first found me and it was soon after that I began appearing before the board of the Contra Costa Water District (CCWD) to express my opposition to the construction of the original Los Vaqueros Reservoir. Even though I failed in having any success in stopping the project, I feel my relationship with the board over the years helped shape the discussion about preservation of the caves and its resources.

I watched during the construction of LVR, California's largest remaining stand of Valley Oaks get turned into mountains of firewood along with the nearly one dozen golden eagles nests that stood proudly within them. The list of endangered and threatened species that lost critical habitat is staggering. The largest and most intact habitats for the kit fox, red legged frog, tiger salamander, and numerous other plants and animals was lost forever with the creation of LVR.

The way that the CCWD was able to get around these "significant losses" was with the use of Habitat Conservation Plans (HCP's), which are an unproven theory that says habitat can be recreated somewhere else. My contention is that the majority of Los Vaqueros' HCP's have failed. I have seen for myself the decline of the animal and plant species that were supposed to be protected at all costs with CCWD mitigations. And now CALFED proposes to flood these habitats set aside as mitigation to the losses incurred by the construction of the original LVR. How is CALFED going to mitigate these losses?

The specific loss I am choosing to comment on concerns Vasco Caves western most outcrops that under the current plan would be inundated by the construction of the enlarged Los Vaqueros Reservoir. I have written to CALFED numerous times and have appeared before the CCWD board with this specific concern and I have come away with the understanding that they were not even aware of this loss. I have also yet to hear any response to my concern.

The rock outcrops I speak of are easily found as they are the only ones found in the Kellog creek watershed (hence their inundation) and fall outside the Vasco Cave Regional Preserve. The fact that a lot of people are not aware of them because they are not part of the Preserve does not mean that they are not significant. They are extremely sacred and have numerous archeological resources including midden and rock art sites.

There are also all the protected species that are found at the other parts of the Vasco Caves.

So I would like the record to show that I have brought up the fact that the enlargement of LVR would destroy a large portion of Vasco Caves and that CALFED and the CCWD has failed to answer any of my previous comments, questions, and concerns about this fact and that I have failed to find anywhere in the documentation any mention of this loss.

Thank you for you time and consideration.

Sincerely,

John E. Negrete
347 Nile Street, #4
Nevada City, CA 95959
(530)559-3857
johnnegrete@hotmail.com

LOS VAQUEROS RESERVOIR EXPANSION EIS/EIR

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

CONTRA COSTA WATER DISTRICT

COMMENT CARD

Comments may be submitted today or mailed to:
Los Vaqueros Reservoir Expansion Project
c/o Contra Costa Water District
P.O. Box H20
Concord, CA 94524-2099

Please submit comments by 5:00 p.m. February 28, 2006

Name: Bill Bennett

Affiliation: DWR

Address: 901 P st.
Sacramento CA

Phone: 916 651-7051

E-mail: bennett @ water.ca.gov.

Comments:
The Alternative of not raising Los Vaqueros Dam but building the pipeline/canal intertie to Bethany and the SWP should be evaluated. This would provide possible EWA benefits w/o extensive dam reformulation costs.

Please use the reverse side or attach any additional pages

Peter Margiotta
122 Castle Crest Rd.
Alamo, California 94507
Telephone 925-944-1188

January 26, 2006

Ladies/Gentlemen:

Re; Scoping Issues for the Enlarged Los Vaqueros Reservoir Project

1. Consider the importance of the recreational value of scull-boat hunting on the enlarged reservoir and its positive effects on hunting opportunities in the Delta. Please note that scull-boat hunting is allowed on many reservoirs and forebays, which are adjacent to waterfowl hunting areas.

2. What will be the biological impact on the pacific waterfowl migratory species be when unnatural rafting is allowed to occur on this new larger reservoir.

3. What will be the impact on water quality (salinity) when the existing reservoir is taken out of operation and the district diverts water out of Middle River? This question obviously need an analysis of water quality in Middle River at you anticipated point of diversion and you should consider a variety of water-year types.

4. Based on what you learn with regard to water quality conditions in Middle River, you should consider an alternative of leaving the existing reservoir in place and changing your existing point of diversion on Old River to a new point of diversion on Middle River. This alternative will support your ratepayers' strong position in opposition to a peripheral canal.

5. Have your ratepayers' been informed that a new enlarged Los Vaqueros Reservoir will facilitate the building of a peripheral canal, and if not how will [redacted]?
   they

Thank you in advance for considering and analyzing these issues.

Sincerely,

Peter Margiotta

Peter Margiotta

California Native Plant Society

East Bay Chapter
P O Box 5597, Elmwood Station
Berkeley, CA 94705

January 26, 2006

CALFED Los Vaqueros Reservoir Expansion Studies
PO Box H2O
Concord, CA 94524
(925) 688-8018

Re: Notice of Preparation for an Environmental Impact Report and Statement for the Los Vaqueros Reservoir Expansion Project

Dear CALFED Los Vaqueros Reservoir Expansion Project Study Team:

The California Native Plant Society thanks the US Bureau of Reclamation and the Contra Costa Water District for the opportunity to comment upon the Scoping for the EIS/EIR on the proposed expansion of the Los Vaqueros Reservoir. CNPS is a statewide organization of some 10,000 members whose mission is to conserve and protect the native plant species and native plant communities in California. The Society's mission is to increase the understanding and appreciation of California's native plants and to preserve them in their natural habitat through scientific activities, education, and conservation.

The following letter lists some preliminary concerns of the East Bay Chapter of the California Native Plant Society regarding the Reservoir Expansion Project (REP) of the Los Vaqueros dam. The following comments are by no means exhaustive, but rather considerations that should be addressed in the corresponding environmental reports. Pursuant to the mission of protecting California's native flora and vegetation, CNPS submits the following comments for the scoping process:

- First and foremost, knowing that this expansion project will irreversibly alter the ecological function of approximately 2,000 acres of land, the study needs to prove that the expansion of the dam is the **only** viable option for achieving the goals listed by the Contra Costa Water District (CCWD). CNPS holds that any major water diversion project has enormous implications to the entire San Francisco Bay/Delta/Estuary ecosystem. Any major water diversion project will affect this entire system from the Suisun Marsh, the largest contiguous freshwater marsh in the US, to the estuarine wetlands around the Bay which are dependent on the flushing action of water from upstream sources. The south end of the Bay is particularly vulnerable to the loss of freshwater flows because it receives so little freshwater flow from the immediate area, hence its high salinity. Water quality issues for the entire system are crucial, and the EIR/S must address cumulative impacts from all freshwater diversion, not just the local impacts to the delta. Hydrologic modeling would provide viable answers to the change in salinity, flow patterns and other important water quality issues. In addition to water issues, construction disturbance greatly affects native plant populations in so many ways that are terribly difficult to mitigate effectively. Alternatives need to be considered exhaustively for maintaining the assurance promulgated by the CCWD Board of Directors for the REP that reads; *1) provide long-term environmental benefits to the Delta ecosystem,* and *2) enhance the terrestrial habitat and recreational opportunities*.

- Another critical factor in the scoping process is to ensure, that the EIS and EIR will satisfy state and federal requirements concerning plant species of concern. Appendix 1: CEQA-Protected Rare and Unusual Plants of Los Vaqueros, indicates that 92 species of concern need to be addressed in this document in order for it to be valid and complete. Considerations for direct and indirect harm to these plants and populations need to be considered for the anticipated 6-year construction process. These harms include: direct inundation of land and populations, direct effect to soil moisture content and subsequent plants with an "impact-zone" of the expanded waterline, direct effect of soil compact and change in soil physical properties in areas with increased traffic and movement, indirect effect of increased particulate matter and air pollutants, indirect effect of increased noise on pollinators and seed dispersers for the plant species.

- At least two species need to be considered with great prudence. At least one population of *Calochortus pulchellus* will be inundated that, as far as we know, is the eastern-most population of this species. Another plant in the proposed inundation area is *Thysanocarpos radians*, one of our locally rare, or "unusual" plants that may be more common in other parts of the state, but that is limited in our area. These and any additional CEQA-protected species within the area of construction and inundation need to be mapped. Additionally, mitigation plans need to specifically spell out measures taken to ensure that mitigation is done correctly and effectively, and monitored for a minimum of five years after project completion.

- While the attached list contains the special status plant species known to exist in the Los Vaqueros area, there is potential for additional special status species to be found on the project site. For this reason, CNPS requests that the DEIR allow for complete surveys for federally and state listed species as well as special-status plants, bryophytes and wildlife that are protected under CEQA. We request that a thorough biological site assessment be conducted at the project site by qualified botanists and wildlife biologists to determine if suitable habitat exists for special-status plant, bryophyte, and wildlife species. If suitable habitat exists, in order for a project to comply with CEQA, focused protocol-level special-status species surveys should be conducted at the site prior to issuing a permit. CNPS requests that protocol-level plant surveys be conducted during the appropriate active growing stage of the life cycle of the target species. The surveys require adequate advance planning. Furthermore, we recommend that in addition to addressing federal and state listed species and CNPS List 1A, 1B and 2 species, the following species should also be addressed prior to issuing permits: plants and bryophytes that are CNPS List 1A, 1B, 2, 3 or 4 species, lichens on CDFG's Special Vascular Plants, Bryophytes, and Lichens List[1], plants listed in the *Rare, Unusual and*

[1] CDFG. California Department of Fish and Game Natural Diversity Database; Special Vascular Plants, Bryophytes, and Lichens List. July 2004 (periodically updated).

Significant Plants of Alameda and Contra Costa Counties, and plants that are federal species of concern or federally-listed as species of local concern. This request is in accordance with CDFG Habitat Conservation Planning Branch recommendations for "…protection of plants which are regionally significant, such as locally rare species, disjunct populations of more common plants, or plants on the CNPS Lists 3 and 4."[2]

- Plants make up an integral element of an ecosystem. In the case of the REP, many plant communities that provide habitat to special status animals will be affected by the proposed plan. In order to fairly assess the damage to the ecosystem, and cumulative damages incurred, it serves the committee well to consider the landscape metrics of this site, in order to understand how this landscape supports the wonderful environment within it. We would like to see an analysis utilizing landscape metrics that may better predict the how the populations and metapopulations of red-legged frogs, tiger salamanders, and fairy shrimp (to name a few) will function in a new landscape.

- Given that the expansion can be argued soundly, mitigations also need to be carefully considered at this stage in the process. The expansion is scheduled to inundate mitigations from the initial dam construction. These mitigations include, but are not limited to; one to two acres of mitigation wetlands and up to 176 acres of recently planted oak seedlings. The loss of these mitigations needs to be deemed necessary for this report, in addition to mitigation efforts that will anticipate additional harm or take to special status plant species.

- CNPS requests on-site mitigation for the plant species on the attached list as well as any other federal or state listed species and special status species found during surveys. Harmful impacts on these species should be avoided.

- Restoration work and mitigation work will utilize only certified native plants grown from locally collected seed in order to maintain the genetic integrity of the existing populations. Best management practices will be utilized in order to restrict any introduction of weeds and invasive species. If such new species are found post-construction, the abatement and removal of this damage needs to be addressed in mitigation practices.

CNPS looks forward to submitting further comments through the scoping and EIS/R process. Questions and concerns can be addressed to the Conservation Analyst. We look forward to working with you on this process.

[2] Department of Fish and Game Habitat Conservation Branch. http://www.dfg.ca.gov.hcpb/species/t_e_spp/nat_plnt_consv.shtml. Accessed on December 9, 2004

Sincerely,

Lech Naumovich
East Bay Conservation Analyst
California Native Plant Society
(510) 734 - 0335

APPENDIX 1: CEQA-Protected Rare and Unusual Plants of Los Vaqueros 2005

(Statewide Rare Plants in Upper Case)

Rank in East Bay	Species	Common Name	Habitat
	Allenrolfea occidentalis	iodine bush	Alkali areas
A2	Allium amplectens	narrow-leaved onion	Dry Open Slopes; Serpentine; Woodland; Misc. habitats
A1	Allium crispum	crinkled onion	Dry Open Slopes; Serpentine; Misc. habitats
A2	Amsinckia eastwoodiae	Eastwood's fiddleneck	Grassland; Misc. habitats
*A1	AMSINCKIA GRANDIFLORA	large-flowered fiddleneck	Grassland; Sand or Sandstone; Misc. habitats
*A2	ARCTOSTAPHYLOS AURICULATA	Mt. Diablo manzanita	Chaparral; Sand or Sandstone
A1?	Aristida oligantha(?)	oldfield three-awn	Dry Open Slopes; Grassland; Scrub; Woodland
A1?	Astragalus oxyphysus(?) (A. asymmetricus is more common)	Diablo locoweed	Grassland; Scrub
*A1	ASTRAGALUS TENER VAR. TENER	alkali milk-vetch	Alkali areas; Grassland; Vernal Pools; Misc. Wetlands
*A2	ATRIPLEX CORONATA VAR. CORONATA	crownscale	Alkali areas; Grassland; Vernal Pools
*A2	ATRIPLEX DEPRESSA	brittlescale	Alkali areas; Grassland; Misc. Wetlands
*A2	ATRIPLEX JOAQUINIANA	San Joaquin saltbush	Alkali areas; Grassland; Misc. Wetlands
A2	Berberis aquifolium var. dictyota	Jepson's mahonia	Chaparral; Forest; Rock, Tallus or Scree; Scrub; Woodland
A1	Calochortus invenustus	plain Mariposa-lily	Dry Open Slopes; Misc. habitats
*A2	CALOCHORTUS PULCHELLUS	Mt. Diablo fairy-lantern	Chaparral; Serpentine; Woodland
A2	Carex senta	rough sedge	Riparian areas; Misc. Wetlands
A2	Castilleja applegatei ssp. martinii	wavy-leaved Indian paintbrush	Chaparral; Scrub
A1	Claytonia rubra ssp. depressa	miner's lettuce	Scrub
A2	Collinsia parviflora	blue-eyed Mary	Misc. habitats
*A1	CONVOLVULUS SIMULANS	small-flowered morning-glory	Grassland; Serpentine; Misc. habitats
A2	Cyperus niger	black sedge	Misc. Wetlands; Misc. habitats
A1	Delphinium gracilentum	meadow larkspur	Forest
A1	Dodecatheon clevelandii ssp. sanctarum (ssp. patulum is more common)	Padre's shooting star	Woodlands
A1	Downingia bella	Hoover's downingia	Vernal Pools
A2	Downingia insignis	cupped downingia	Vernal Pools
A2	Ericameria arborescens	golden-fleece	Chaparral; Forest; Woodland
*A2	ERIOPHYLLUM JEPSONII	Jepson's woolly sunflower	Chaparral; Serpentine; Woodland
A2	Eryngium vaseyi	Vasey's coyote-thistle	Alkali areas; Vernal Pools
A2	Eschscholzia caespitosa	tufted poppy	Chaparral
A2	Festuca elmeri	Elmer's fescue	Riparian

A2	Parvisedum pentandrum	Mount Hamilton sedella	Rock, Tallus or Scree; Sand or Sandstone areas; Serpentine
A2	Pilularia americana	pillwort	Vernal Pools; Misc. Wetlands
A2	Plagiobothrys leptocladus	alkali plagiobothrys	Alkali areas
A2	Plagiobothrys tenellus	slender popcornflower	Misc. habitats
A2	Plectritis ciliosa ssp. unknown	long-spurred plectritis	Grassland; Woodland
A2	Plectritis congesta	sea blush	Coastal Bluff; Woodland
A2	Pleuropogon californicus	semaphore grass	Riparian areas; Misc. Wetlands
A2	Puccinellia simplex	little alkali grass	Alkali areas
A1	Quercus X joloensis	blue oak X valley oak	Forest; Woodland
A2	Ranunculus occidentalis	western buttercup	Grassland; Woodland
A2	Ribes quercetorum	oak gooseberry	Chaparral; Woodland
A2	Rorippa curvisiliqua	yellow cress	Freshwater Marsh
A2	Salix scouleriana	Scouler's willow	Misc. Wetlands
A2	Sesuvium verrucosum	sea-purslane	Alkali areas
A1?	Solanum xantii(?) (S. umbelliferum is more common)	purple nightshade	Forest; Scrub; Woodland
A2	Spergularia macrotheca var. leucantha	large-flowered sand spurry	Alkali areas; Vernal Pools
A2	Sporobolus airoides	alkali sacaton	Alkali areas
A2	Thysanocarpus radians	ribbed fringe pod	Misc. habitats
A2	Tropidocarpum gracile	slender tropidocarpum	Alkali areas; Grassland
A2	Viola purpurea ssp. quercetorum	mountain violet	Grassland; Scrub
A2	Vulpia microstachys var. microstachys (var. pauciflora is more common)	Nuttall's fescue	Dry Open Slopes; Rock, Tallus or Scree; Sand or Sandstone; Serpentine; Woodland
A1?	Zigadenus paniculatus(?) (Z. fremontii is more common)	panicled zygadene	Dry Open Slopes; Forest; Misc. habitats

Explanation of Ranks

***A1 or *A2**: Species in Alameda and Contra Costa counties listed as rare, threatened or endangered statewide by federal or state agencies or by the state level of CNPS.

A1x: Species previously known from Alameda or Contra Costa Counties, but now presumed extirpated here.

A1: Species currently known from 2 or less regions in Alameda and Contra Costa Counties.

A2: Species currently known from 3 to 5 regions in the two counties, or, if more, meeting other important criteria such as small populations, stressed or declining populations, small geographical range, limited or threatened habitat, etc.

A1?: Species with taxonomic or distribution problems that make it unclear if they actually occur here.

Appendix H

CCWD Board of Directors Resolution No. 03-24, June 25, 2003

ESA

RESOLUTION NO. 03-24

A RESOLUTION OF THE BOARD OF DIRECTORS OF CONTRA COSTA WATER DISTRICT MAKING DETERMINATIONS AND ADOPTING CONDITIONS FOR DISTRICT PARTICIPATION IN AND SUPPORT FOR IMPLEMENTATION OF THE CALFED BAY-DELTA PROGRAM PROPOSAL FOR EXPANSION OF LOS VAQUEROS RESERVOIR

RECITALS

1. DISTRICT MISSION: The mission of the Contra Costa Water District ("District") is to strategically provide a reliable supply of high quality water at the lowest cost possible, in an environmentally responsible manner.

2. 1998 LOS VAQUEROS PROJECT PURPOSES: On May 2, 1998 the District dedicated and put into service the Los Vaqueros Project, a 100,000 acre-foot drinking water reservoir in eastern Contra Costa County. The Los Vaqueros Project's primary purposes, as set forth in District Resolution 88-45 (July 27, 1988), are "to improve water quality and provide emergency storage for the District's ratepayers". The additional purposes of the Los Vaqueros Project, as also set forth in Resolution 88-45 (July 27, 1988), are "to provide flood control benefits, maintain and enhance fish and wildlife resources, and provide recreational opportunities consistent with the primary water quality purpose and the preservation of the watershed and the watershed's unique features".

3. ADDITIONAL CONDITIONS SPECIFIED IN 1988 LOS VAQUEROS BALLOT MEASURE: On November 8, 1988, the District's voters overwhelmingly approved the sale of revenue bonds to finance the Los Vaqueros Project, and the election results were declared by the District's Board in its Resolution 88-58

(November 30, 1988). The ballot measure placed before the District's voters by the District's Board of Directors in 1988 said, as required by District Resolution 88-46:

> "Shall the Contra Costa Water District be authorized to issue and sell revenue bonds to finance the construction and acquisition of a District-controlled water storage and supply system, generally known as the Los Vaqueros Project, for the primary purposes of enhancing water quality and providing a source of emergency water supply, which shall not be operated in conjunction with a peripheral canal or to increase the export of water from Northern California without subsequent voter approval, with an estimated cost to the District in 1988 dollars of $350,000,000, including reservoirs, recreational facilities, pipelines, pumping plants, fish screens, watershed lands, and other facilities convenient or necessary in obtaining and delivering water and mitigating the environmental impacts thereof?"

4. COMPLIANCE WITH PROJECT PURPOSES AND CONDITIONS: The Los Vaqueros Project has been meeting and will continue to meet the District's commitment, as specified by Resolution 88-45 to:

- provide its customers with high quality water;
- provide its customers with an emergency supply of water;
- provide flood control benefits;
- maintain and enhance the fishery and terrestrial resources of the Delta and the watershed; and
- provide recreational opportunities consistent with the protection of water quality and emergency storage objectives and preservation of the watershed and the watershed's unique features.

Further, the Los Vaqueros Project has also achieved the following results:

- The District built the Los Vaqueros Project at a total cost *less* than the budget of $450,000,000 in actual expenditures ($350,000,000 in 1988 dollars) as committed to and specified by Resolution 88-45;

- The environmental mitigation and protection measures for the Delta and the Los Vaqueros Watershed have exceeded the expectations described in the Final Stage 2 Environmental Impact Report/Environmental Impact Statement for the Los Vaqueros Project (Stage 2 EIR/EIS), provide a net benefit to the Delta and the watershed, and exceed the District's commitment to mitigate environmental impacts to a level of less than significant, as specified by Resolution 88-45;
- The District's Board of Directors committed to developing a recreation plan for the Los Vaqueros Project as part of the Stage 2 EIR/EIS, as specified by Resolution 88-45, and said plan was developed in 1990, adopted by the Board February 15, 1991, and included in the Stage 2 Final EIR/EIS certified by the Board on October 27, 1993;
- The District has implemented a recreation program that significantly exceeds the plan described in the Stage 2 Final EIR/EIS;
- The recreation program at the Los Vaqueros Watershed has been a success, providing a well-attended interpretive center, docent tours of watershed features, more than fifty-five miles of trails, including sixteen miles of multi-use trails with linkages to adjacent lands that are open to the public, and a public fishing resource that has become widely recognized as one of the best of the Bay Area;
- The Los Vaqueros Project is entirely owned and operated by the District; and the entire cost of the Los Vaqueros Project was paid for by the ratepayers of the District; and
- It is the policy of the District to maintain rate increases below the level of inflation; and the District has complied with its policy by maintaining rate increases at less than the rate of inflation for over 10 years, with the

average rate increase during the last 10 years equating to one half of the rate of inflation during that period.

5. CALFED BAY-DELTA PROGRAM PROPOSAL FOR EXPANSION OF LOS VAQUEROS RESERVOIR: CALFED is a consortium of state and federal agencies which are working together to solve the problems of the Sacramento-San Joaquin Delta. The mission of the CALFED Bay-Delta Program is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta System.

The CALFED Agencies issued the CALFED Bay-Delta Program Final Programmatic Environmental Impact Statement/Environmental Impact Report (CALFED Final PEIS/R) in July 2000, which described the long-term program to restore ecological health and improve water management in the Delta, and disclosed the impacts, cumulative impacts and mitigation measures and strategies for the entire CALFED Bay-Delta Program. The CALFED Agencies on August 28, 2000 adopted Findings and a Programmatic Record of Decision (CALFED ROD) that sets forth the CALFED Bay-Delta Program that is now being implemented. The CALFED ROD requires that project specific environmental documents tier off of the CALFED Final PEIS/R and include specific mitigation measures consistent with the programmatic measures of the CALFED ROD.

The CALFED ROD included expansion of Los Vaqueros Reservoir by up to 400,000 acre-feet (for a total water storage capacity of up to 500,000 acre-feet) as a surface storage project with participation by CCWD and local partners as part of a Bay Area water quality and water supply reliability initiative. The CALFED ROD states: "As part of a Bay Area initiative, an expanded Los Vaqueros Reservoir would provide water quality and water supply reliability benefits to Bay Area water users."

6. CONTRA COSTA WATER DISTRICT PRINCIPLES FOR AN EXPANSION: The District has an interest in the CALFED Bay-Delta Program objectives to provide water quality and supply reliability benefits to Bay Area water users, and to enhance and restore the aquatic and terrestrial habitats and ecological functions of the Bay-Delta. The District must also ensure that the interests of the District and its ratepayers are protected. On April 19, 2000 the District's Board of Directors adopted seven principles (CCWD Principles) with regard to the CALFED ROD that state: "Contra Costa Water District will not support a proposal involving the existing Los Vaqueros Project or use of the Los Vaqueros or Kellogg reservoir sites without the following assurances:

1. The project improves water quality and reliability for CCWD;
2. The project enhances the Delta environment;
3. The project protects and enhances the fisheries and terrestrial species benefits provided by the existing Los Vaqueros Project;
4. The project preserves and increases the recreational opportunities of the Los Vaqueros Project;
5. CCWD must retain control of the watershed and operation of the reservoir;
6. The project protects and reimburses the financial investment made by the CCWD customers who financed the existing $450 million Los Vaqueros Project; and
7. The proposal would be placed before the voters of the Contra Costa Water District

In express recognition of these principles, the CALFED ROD states: "As an existing reservoir operated by the Contra Costa Water District (CCWD), the Los Vaqueros Reservoir is subject to a number of mandates and agreements. DWR and Reclamation will work with CCWD and interested stakeholders to assure that previous commitments, including local voter approval required for expansion, are respected."

7. OVER $50 MILLION OF CALFED STUDIES INCLUDING EXPANSION OF LOS VAQUEROS RESERVOIR AND $7 MILLION OF LOS VAQUEROS EXPANSION STUDIES COMPLETED, AND OVER THIRTY PUBLIC MEETINGS TO DATE: CALFED Agencies have, through a seven-year effort costing over $57 million, studied the environmental impacts of the CALFED Program, including the details of the Los Vaqueros Reservoir expansion, and have studied key planning concerns associated with the Los Vaqueros Reservoir. The CALFED Final PEIS/R constitutes the first tier of environmental analysis, addressing the effects of the CALFED Bay-Delta Program as a whole. Since CALFED Agencies adopted the Record of Decision, CALFED Agencies and the District have formed a Study Team for the purpose of carrying out the CALFED Los Vaqueros Reservoir Expansion Studies (Studies), which started in January 2001. The California Department of Water Resources, California Department of Fish and Game, U.S. Fish and Wildlife Service, Alameda County Water District, Zone 7 of Alameda County Flood Control and Water Conservation District, Santa Clara Valley Water District, City and County of San Francisco Public Utilities Commission, San Francisco Bay Area Water Users Association, and the District executed a Memorandum of Understanding in 2001 that describes how the Studies would be carried out. The District has implemented a public process designed to provide in-depth public information, feedback and consultation:

- A Draft Project Concept Report was produced in August 2002 that conceptually described how a Los Vaqueros Reservoir expansion could be carried out in a way that would meet the CALFED ROD objectives for an expansion project and the District's Principles;
- The Draft Project Concept Report was published and made available at public libraries and other facilities convenient to the general public, and was made

available on the Studies' website, and three public workshops were held on the Draft Project Concept Report on September 10 and September 16, 2002;

- Comments were received from the public on the Draft Project Concept Report through written correspondence and at the public workshops, and all comments on the Draft Project Concept Report were kept as part of the public record;
- Based upon this public participation and further detailed study, a Draft Planning Report was produced in May 2003 that included the detailed information required to determine whether the CALFED Bay-Delta Program proposal could meet the CALFED ROD objectives for an expansion project and the District's Principles,
- The Draft Planning Report described in detail the facilities required for the full range of scenarios of a reservoir expansion under the CALFED Bay-Delta Program proposal, the costs of the facilities, potential project partners, and the operations of the facilities that would be required to meet the CALFED ROD objectives for an expansion project and the District's Principles,
- The Draft Planning Report included an environmental impact analysis that described in detail the full range of environmental impacts of a Los Vaqueros Reservoir expansion, including the details of impacts on: Delta water quality; water levels; water velocities; channel flows; salinity in the western Delta and Bay; fishery and aquatic resources in the Delta and Bay; terrestrial habitat and species as a result of inundating lands within the watershed; terrestrial habitat and species as a result of constructing the project facilities; socioeconomics of the area; environmental justice; and growth;
- The Draft Planning Report also described in detail the benefits of the project for water supply during droughts and water quality for the District and the Bay Area; the net benefits that a Los Vaqueros Reservoir expansion project would

have for Delta fisheries and aquatic resources; the mitigation strategies that would be required to reduce terrestrial impacts in order to meet the CALFED Bay-Delta Program objectives described in the CALFED ROD and the District's Principles; and the institutional arrangements that are required to meet the District's Principles for a CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir;

- The Draft Planning Report also described in detail how the District's investment in the Los Vaqueros Project would be protected and estimated that the District would be reimbursed an amount of up to $200,000,000 in 2008 dollars;
- Copies of draft sections of the Draft Planning Report, known as Draft Briefing Papers, were published and made available at public libraries and other facilities convenient to the general public, and were made available on the Studies website;
- More than thirty public meetings and public workshops within the District and the Bay Area were held on the Draft Project Concept Report, Draft Briefing Papers and Draft Planning Report. Twenty Public Workshops on the Draft Briefing Papers and Draft Planning Report were held on January 30, February 4, February 19, March 4, March 6, March 19, April 17, April 22, May 21, May 29, June 3, June 4 and June 18, 2003, and comments were received from the public through written correspondence and at the public workshops on the Draft Briefing Papers; and
- All comments on the Draft Briefing Papers were kept as part of the public record and together with the comments on the Draft Project Concept Report were responded to and incorporated into and made part of the Draft Planning Report.

The information contained in the Draft Planning Report shows that the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir that meets the

CALFED ROD objectives for said expansion can and will meet the Principles 1 through 6 inclusive, as adopted by the District's Board of Directors on April 19, 2000. Specifically, the Draft Planning Report shows that water supply reliability during droughts and water quality will be improved by storing high-quality water in the expanded reservoir during wet periods for use in periods of drought; the Draft Planning Report further shows that enhancements to the Delta aquatic environment will be made through the use of state-of-the-art fish screens and through improving the timing and location of diversions and the management of water for environmental purposes, made possible by the expanded reservoir.

RESOLUTION

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Contra Costa Water District that the foregoing Recitals are hereby incorporated into and made a part of these determinations by the Board.

BE IT FURTHER RESOLVED that the Board hereby finds and determines that the purposes of the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir for a total water storage capacity up to 500,000 acre-feet, as described in the CALFED ROD, are to improve water supply during droughts and water quality for Bay Area water agencies, including the Contra Costa Water District.

BE IT FURTHER RESOLVED that the Board hereby finds and determines that the purposes of the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir, as described in the CALFED ROD, also are to provide fisheries benefits, to provide environmental benefits, to enhance the Delta environment and to protect Delta endangered species and aquatic resources;

BE IT FURTHER RESOLVED that the Board hereby reaffirms its commitments made to the District's voters in the 1988 Los Vaqueros Project ballot measure that the existing and an expanded Los Vaqueros Reservoir "shall not be operated in conjunction with a peripheral canal or to increase the export of Delta water from Northern California without subsequent [CCWD] voter approval";

BE IT FURTHER RESOLVED that the Board hereby finds and determines that the purposes of the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir do not include operation of the Los Vaqueros Reservoir in conjunction with a peripheral canal or to increase the export of Delta water from Northern California;

BE IT FURTHER RESOLVED that the Board finds and determines that the support of the District for a CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir is dependent upon the CALFED ROD implementation commitment of "beneficiaries pay" and that the costs of any CALFED project for an expanded Los Vaqueros Reservoir will be borne equitably by the beneficiaries of said project.

BE IT FURTHER RESOLVED that the Board finds and determines that the support of the District for a CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir is dependent upon authorizing federal and/or state legislation that specifically provides for long-term environmental benefits in the Delta as a project purpose.

BE IT FURTHER RESOLVED that consistent with the District's Principles for participation adopted by the Board of Directors on April 19, 2000 and recognized in the CALFED Bay-Delta Program Programmatic Record of Decision on August 28, 2000, the Board finds and determines that the District will not participate in or support the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir unless the Board determines that the CALFED Bay-Delta Program proposal meets the following conditions:

1. Improves drinking water quality for CCWD customers beyond that available from the existing Los Vaqueros Project;
2. Improves the reliability of water supplies for CCWD customers during droughts;
3. Enhances Delta habitat and protects endangered Delta fisheries and aquatic resources by installing state-of-the-art fish screens on all new intakes and creating an environmental asset through improved location and timing of Delta diversions and storage of water for environmental purposes;
4. Increases the protected land and managed habitat for terrestrial species in the Los Vaqueros Watershed and the surrounding region;
5. Improves and increases fishing, boating, hiking, and educational opportunities in the Los Vaqueros Watershed, consistent with the protection of water quality and the preservation of the watershed and the watershed's unique features;
6. CCWD continues as owner and manager of the Los Vaqueros Watershed;
7. CCWD maintains control over recreation in the Los Vaqueros Watershed;
8. CCWD continues as operator of the Los Vaqueros Reservoir system;
9. CCWD will be reimbursed for the value of the existing Los Vaqueros Project assets shared, replaced, rendered unusable or lost with the expansion project and said reimbursement will be used to purchase additional drought supply and water quality benefits or reduce debt on the existing Los Vaqueros Project;
10. Water rates for CCWD customers will not increase as a result of the expansion project.

BE IT FURTHER RESOLVED that the conditions expressed above regarding implementation of the CALFED Bay-Delta Program proposal for expansion of Los

Vaqueros Reservoir are hereby adopted by the Board of Directors as specific policies of the Contra Costa Water District, and the Board of Directors hereby commits to be bound by said policies in regard to the CALFED Bay-Delta Program proposal.

BE IT FURTHER RESOLVED, that the Board hereby finds and declares that the information contained in the CALFED Final PEIS/R, the Draft Project Concept Report and the Draft Planning Report, together with the information contained in the technical memoranda, all of the comments from the public, and all of the responses to the public comments are hereby made a part of the District's public records concerning consideration of the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir for a total water storage capacity up to 500,000 acre-feet.

BE IT FURTHER RESOLVED that, under the CALFED ROD, and under the principles adopted by the Board of Directors on April 19, 2000, all subsequent environmental documents required for approvals and permitting will tier off the CALFED Final PEIS/R and will incorporate the full range of environmental impacts described in the Draft Planning Report, and that the full range of environmental impacts, and the specific mitigation measures for these impacts consistent with the programmatic measures of the CALFED ROD, will be disclosed in the environmental documents, and that sound science will be used as part of that process.

BE IT FURTHER RESOLVED that the Board hereby finds and determines that, due to the importance of Los Vaqueros Reservoir, water supply during droughts, water quality, Delta water issues, and environmental issues to the Contra Costa Water District, the District should allow its voters to have an opportunity at an election, to be held throughout the District, to advise the Board on whether they concur with the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir, subject to the conditions and assurances specified as District policies by this Resolution.

BE IT FURTHER RESOLVED that the District shall retain the opportunity, which shall be solely within the discretion of the District's Board of Directors, to withdraw District participation in and support for the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir in the event that the conditions established by said District policies are not met.

BE IT FURTHER RESOLVED that the District's General Manager is hereby authorized and directed to take such steps as he shall determine to be necessary and appropriate to inform the CALFED Bay-Delta Program, and all persons and entities that have expressed an interest in the CALFED Bay-Delta Program proposal for expansion of Los Vaqueros Reservoir, of these determinations and conditions.

* * * * * * * * *

The foregoing resolution was duly and regularly adopted at a meeting held on the 25th day of June 2003, by the Board of Directors of Contra Costa Water District by the following vote:

AYES: Pretti, Boatmun, Anello, Campbell, and Wandry

NOES: None

ABSENT: None

Joseph L. Campbell, President

ATTEST:

Lynne Holland

Lynne C. Holland, Acting District Secretary

A-2 CCWD CEQA NOTICE OF COMPLETION

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #2006012037

Project Title: Los Vaqueros Reservoir Expansion Project

Lead Agency: Contra Costa Water District | Contact Person: Marguerite Naillon
Mailing Address: PO Box H2O | Phone: (925) 688-8018
City: Concord | Zip: 94524-2099 | County: Contra Costa

Project Location: County: Contra Costa and Alameda Counties | City/Nearest Community: Brentwood, Byron
Cross Streets: | Zip Code: 94513, 94514
Longitude/Latitude (degrees, minutes and seconds): 121 ° 43 ′ 40.41″ N / 37 ° 50 ′ 53 ″ W | Total Acres: 20,800
Assessor's Parcel No.: Multiple Parcels | Section: | Twp.: 02S, 03S | Range: 02E, 03E | Base: M.D.B. &M.
Within 2 Miles: State Hwy #: 4 | Waterways: Sacramento-San Joaquin Delta, Kellogg Creek
Airports: Bryon Airport | Railways: | Schools:

Document Type:

CEQA: [ ] NOP [ ] Early Cons [ ] Neg Dec [ ] Mit Neg Dec [x] Draft EIR [ ] Supplement/Subsequent EIR (Prior SCH No.) Other:

NEPA: [ ] NOI [ ] EA [x] Draft EIS [ ] FONSI

Other: [x] Joint Document [x] Final Document [ ] Other:

Local Action Type:

[ ] General Plan Update [ ] Specific Plan [ ] Rezone [ ] Annexation
[ ] General Plan Amendment [ ] Master Plan [ ] Prezone [ ] Redevelopment
[ ] General Plan Element [ ] Planned Unit Development [ ] Use Permit [ ] Coastal Permit
[ ] Community Plan [ ] Site Plan [ ] Land Division (Subdivision, etc.) [x] Other: Water & Power

Development Type:

[ ] Residential: Units ___ Acres ___
[ ] Office: Sq.ft. ___ Acres ___ Employees ___
[ ] Commercial: Sq.ft. ___ Acres ___ Employees ___
[ ] Industrial: Sq.ft. ___ Acres ___ Employees ___
[ ] Educational:
[ ] Recreational:
[x] Water Facilities: Type Storage Reservoir/ Pipelines/Pumps MGD Up to 275 TAF
[ ] Transportation: Type
[ ] Mining: Mineral
[x] Power: Type Transmission Lines/ Substation MW
[ ] Waste Treatment: Type MGD
[ ] Hazardous Waste: Type
[ ] Other:

Project Issues Discussed in Document:

[x] Aesthetic/Visual [ ] Fiscal [x] Recreation/Parks [x] Vegetation
[x] Agricultural Land [x] Flood Plain/Flooding [ ] Schools/Universities [x] Water Quality
[x] Air Quality [x] Forest Land/Fire Hazard [ ] Septic Systems [x] Water Supply/Groundwater
[x] Archeological/Historical [x] Geologic/Seismic [ ] Sewer Capacity [x] Wetland/Riparian
[x] Biological Resources [x] Minerals [x] Soil Erosion/Compaction/Grading [x] Growth Inducement
[ ] Coastal Zone [x] Noise [x] Solid Waste [x] Land Use
[x] Drainage/Absorption [ ] Population/Housing Balance [x] Toxic/Hazardous [x] Cumulative Effects
[x] Economic/Jobs [x] Public Services/Facilities [x] Traffic/Circulation [x] Other: Palentological Resources, Climate Change

Present Land Use/Zoning/General Plan Designation:

Multiple land use designations including agriculural and open space

Project Description: *(please use a separate page if necessary)*

Construct and operate an expanded Los Vaqueros Reservoir with a storage capacity of up to 275 thousand acre-feet, associated new Delta Intake and Pump Station; up to 19 miles of conveyance pipelines; an enlarged Transfer Facility; additional power supply facilities including a new substation; and recreation facilities. The project purpose is to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs in the Delta and tributary river systems, and to improve water supply reliability and water quality for urban users in the San Francisco Bay Area.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "**X**".
If you have already sent your document to the agency please denote that with an "**S**".

X ____ Air Resources Board
S ____ Boating & Waterways, Department of
____ California Highway Patrol
S ____ Caltrans District # 4, 10
S ____ Caltrans Division of Aeronautics
____ Caltrans Planning
S ____ Central Valley Flood Protection Board
____ Coachella Valley Mtns. Conservancy
____ Coastal Commission
____ Colorado River Board
S ____ Conservation, Department of
____ Corrections, Department of
S ____ Delta Protection Commission
____ Education, Department of
____ Energy Commission
S ____ Fish & Game Region # 2, 3
____ Food & Agriculture, Department of
____ Forestry and Fire Protection, Department of
____ General Services, Department of
S ____ Health Services, Department of
____ Housing & Community Development
____ Integrated Waste Management Board
S ____ Native American Heritage Commission
____ Office of Emergency Services
S ____ Office of Historic Preservation
____ Office of Public School Construction
S ____ Parks & Recreation, Department of
____ Pesticide Regulation, Department of
____ Public Utilities Commission
S ____ Regional WQCB # 2, 5
S ____ Resources Agency
____ S.F. Bay Conservation & Development Comm.
____ San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
____ San Joaquin River Conservancy
____ Santa Monica Mtns. Conservancy
S ____ State Lands Commission
____ SWRCB: Clean Water Grants
S ____ SWRCB: Water Quality
S ____ SWRCB: Water Rights
____ Tahoe Regional Planning Agency
____ Toxic Substances Control, Department of
S ____ Water Resources, Department of

S ____ Other: CalEPA
S ____ Other: California Bay Delta Authority

Local Public Review Period (to be filled in by lead agency)

Starting Date ____________ Ending Date ____________

Lead Agency (Complete if applicable):

Consulting Firm: Environmental Science Associates
Address: 2600 Capitol Avenue, Suite 200
City/State/Zip: Sacramento, CA 95816
Contact: Leslie Mouton
Phone: (916) 564-4500

Applicant: Contra Costa Water District
Address: PO Box H2O
City/State/Zip: Concord, CA 94524-2099
Phone: (925) 688-8018

Signature of Lead Agency Representative: ____________ **Date:** ____________

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

A-3 RECLAMATION NOTICE OF AVAILABILITY

4310-MN-P

DEPARTMENT OF THE INTERIOR

Bureau of Reclamation

Los Vaqueros Reservoir Expansion, Contra Costa County, California

AGENCY: Bureau of Reclamation, Interior.

ACTION: Notice of availability of the Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and notice of public hearings.

SUMMARY: The Bureau of Reclamation (Reclamation), as the National Environmental Policy Act Federal lead agency, and the Contra Costa Water District (CCWD), as the California Environmental Quality Act State lead agency, have made available for public review and comment the Los Vaqueros Reservoir Expansion Project Draft EIS/EIR. The Draft EIS/EIR describes and presents the environmental effects of the No Action Alternative and four action alternatives. Five public hearings will be held to receive comments from individuals and organizations on the Draft EIS/EIR.

DATES: Five public hearings have been scheduled to receive oral or written comments regarding environmental effects:

- Monday, March 23, 2009, 1:30 p.m. – 3:30 p.m., Sacramento, CA
- Tuesday, March 24, 2009, 6:30 p.m. – 8:30 p.m., Livermore, CA
- Thursday, March 26, 2009, 6:30 p.m. – 8:30 p.m., Dublin, CA
- Tuesday, March 31, 2009, 6:30 p.m. – 8:30 p.m., Concord, CA
- Thursday, April 2, 2009, 6:30 p.m. – 8:30 p.m., Oakley, CA

A 1-hour open house to view project information and interact with the project team will precede the public hearings.

The Draft EIS/EIR will be available for a 60-day public review period. Comments are due by **[Insert Date 60 days after date of publication in the FEDERAL REGISTER].**

ADDRESSES: The public hearings will be held at the following locations:

- Sacramento at the Bonderson Building Hearing Room 102A/B, 901 P St.
- Livermore at Zone 7 Water Agency Board Room, 100 North Canyons Parkway
- Dublin at the San Ramon Services District Board Room, 7051 Dublin Blvd.
- Concord at the Heald College and Conference Center, 5130 Commercial Circle
- Oakley at the Ironhouse Elementary Multi-purpose Room, 4801 Frank Hengel Way

Send written comments on the Draft EIS/EIR to Ms. Sharon McHale, Bureau of Reclamation, 2800 Cottage Way, Sacramento, CA 95825.

Copies of the Draft EIS/EIR may be requested from Ms. Sharon McHale, by writing to Bureau of Reclamation, 2800 Cottage Way, Sacramento CA 95825; by calling 916-978-5086 (TDD 916-978-5608); or by e-mailing *smchale@mp.usbr.gov*. The Draft EIS/EIR is also accessible from the following website: *http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=903*. See Supplementary Information Section for locations where copies of the Draft EIS/EIR are available for public review.

FOR FURTHER INFORMATION CONTACT: Ms. Sharon McHale, Bureau of Reclamation, at 916-978-5086 (TDD 916-978-5608) or *smchale@mp.usbr.gov*.

SUPPLEMENTARY INFORMATION: The Draft EIS/EIR documents the direct, indirect, and cumulative effects to the physical, biological, and socioeconomic environment that may result from the expansion of Los Vaqueros Reservoir.

The Los Vaqueros Reservoir Expansion Project Draft EIS/EIR evaluates expanding the existing Los Vaqueros Reservoir and conveyance facilities. The project objectives consist of: (1) developing water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs; (2) increasing water supply reliability for water providers within the San Francisco Bay Area, to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions; and (3) improving the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

One of the five potential surface storage projects described in the CALFED Bay-Delta Program's long-term plan is the expansion of the existing Los Vaqueros Reservoir, an existing 100,000 acre-foot off-stream surface storage facility, located in Contra Costa County, California. The existing facility is owned and operated by the CCWD.

The primary study area includes the Los Vaqueros Reservoir watershed and associated dam and reservoir facilities, which are situated in the coastal foothills west of the Delta and east of the Bay Area, the central and south Delta, and service areas of Bay Area water agencies. The Bay Area water agencies affected include CCWD, Alameda County Water District, Santa Clara Valley Water District, and Alameda County Flood Control and Water Conservation District – Zone 7. Due to the project influence on other programs and projects, an extended study area is defined to include the service areas of the San Francisco Public Utility Commission and the Central Valley of California.

Reclamation was authorized in Public Law 108-7 (Omnibus Appropriations Act of 2003) to conduct a feasibility-level investigation of the potential expansion of Los

Vaqueros Reservoir. Planning studies have focused on identifying water resources problems, needs, and opportunities in the primary study area; developing a set of planning objectives; and formulating alternatives.

Copies of the Draft EIS/EIR are available for public review at the following locations:

- Bureau of Reclamation, Mid-Pacific Region, Regional Library, 2800 Cottage Way, Sacramento, CA 95825
- Contra Costa Water District 1331 Concord Avenue, Concord, CA 94520
- California Bay-Delta Authority, 650 Capitol Mall, 5th Floor, Sacramento, CA 95814
- Bureau of Reclamation, Denver Office Library, Building 67, Room 167, Denver Federal Center, 6th and Kipling, Denver, CO 80225
- Natural Resources Library, U.S. Department of the Interior, 1849 C Street NW., Main Interior Building, Washington, DC 20240-0001

If special assistance is required at the public hearings, please contact Ms. Lynnette Wirth at 916-978-5100, TDD 916-978-5608, or via email at *lwirth@mp.usbr.gov*. Please notify Ms. Wirth as far in advance as possible to enable Reclamation to secure the needed services. If a request cannot be honored, the requestor will be notified. A telephone device for the hearing impaired (TDD) is available at 916-978-5608.

Before including your name, address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment - including your personal identifying information - may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Dated: February 11, 2009

Signed: /s/ Richard M. Johnson
Richard M. Johnson
Acting Regional Director
Mid-Pacific Region

APPENDIX B
Alternatives Development

Introduction

In 2001, the U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region (Reclamation), California Department of Water Resources (DWR), and Contra Costa Water District (CCWD) began appraisal-level studies of the potential to expand Los Vaquero Reservoir to address regional water supply reliability and water quality needs. Expansion of Los Vaqueros was one of five potential surface water storage projects identified by the CALFED Bay-Delta Program (CALFED) as warranting further study. The appraisal-level studies indicated that expanding the reservoir by as much as 400,000 acre-feet was technically feasible and could provide water quality and water supply reliability to Bay Area water agencies in the region and also provide potential benefits to fisheries sensitive to water management operations in the Sacramento-San Joaquin Delta (Delta). Reclamation was directed by the Omnibus Appropriations Act of 2003 to conduct a feasibility-level investigation of the potential expansion of Los Vaqueros Reservoir.

This appendix contains a description of the comprehensive alternatives development process initiated after voters in the CCWD service area approved an advisory measure in 2004 to continue investigating the potential for expansion of Los Vaqueros Reservoir. The alternatives development process was based partly on the *Project Concept Report* (CCWD, 2002) and the *Final Draft Planning Report* (CCWD, 2004). The process resulted in the development of four action alternatives which are evaluated this Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The No Project/No Action Alternative is also discussed.

The alternatives development process consisted of the following three steps:

- Initial concepts
- Initial plans
- Alternatives development and refinement

This appendix also includes a summary of the evaluation of alternative sites for project components including intakes, pipelines, and conveyance facilities that are included in the action alternatives.

Guidelines and Requirements

The following guidelines and requirements were used in the identification, development, and refinement of alternatives. Each is described briefly below.

- Project objectives, purpose, and need
- Planning constraints and guidelines
- Potential project participants and their interests
- Operational parameters including water right permit requirements

Project Objectives, Purpose, and Need

The Los Vaqueros Reservoir Expansion Project objectives are to use an expanded Los Vaqueros Reservoir system to:

Primary Objectives:

- Develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs.

- Increase water supply reliability for water providers within the San Francisco Bay Area to help meet municipal and industrial water demands during drought periods and emergencies or to address shortages due to regulatory and environmental restrictions.

Secondary Objective:

- Improve the quality of water deliveries to municipal and industrial customers in the San Francisco Bay Area, without impairing the project's ability to meet the environmental and water supply reliability objectives stated above.

The primary project purpose is to use an expanded Los Vaqueros Reservoir system to develop water supplies for environmental water management that supports fish protection, habitat management, and other environmental water needs in the Delta and tributary river systems, and to improve water supply reliability for urban users in the San Francisco Bay Area (Bay Area).

The need for this project is driven by the following conditions:

- The Delta ecosystem is in a state of serious decline, with primary productivity very low and fish populations decreasing to record low levels, putting at least one species - the delta smelt (*Hypomesus transpacificus*) - on the brink of extinction.

- Insufficient quantities of water and lack of storage and flexibility in managing the timing and location of diversions for environmental and municipal water supplies are contributing to the ecosystem's decline.

- Ecosystem decline has put other beneficial uses of water supplies conveyed through the Delta at risk, leading to court-ordered limits on Delta pumping and greatly reducing water supply reliability for millions of people.

Improved storage and conveyance of environmental water supplies can help improve the Delta ecosystem conditions and reduce conflict among beneficial uses of Delta water supplies.

Planning Constraints and Guidelines

In addition to physical conditions such as topography and hydrology, a number of planning constraints were considered in the identification, development, and refinement of alternatives, including the federal authorization for the reservoir expansion studies, laws, regulations, and policies, and the CCWD Board Principles. These are discussed below.

Federal Authorization

The Omnibus Appropriations Act of 2003 authorized the Secretary of Interior, in carrying out CALFED-related activities, to undertake feasibility studies for enlarging Los Vaqueros Reservoir and prepare a Federal Feasibility Report. Congress again authorized the Secretary to conduct planning and feasibility studies for enlarging Los Vaqueros Reservoir in the Water Supply, Reliability, and Environmental Improvement Act of 2004. The federal feasibility study must be conducted according to federal planning principles and guidelines. Many of the planning principles are based on the *Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (federal P&Gs)* (U.S. Water Resources Council, 1983).

Laws, Regulations, and Policies

Numerous laws, regulations, executive orders, and policies needed to be considered in developing the alternatives, including the National Environmental Policy Act (NEPA), Fish and Wildlife Coordination Act, Clean Air Act, Clean Water Act, federal and California Endangered Species Acts, California Environmental Quality Act (CEQA), Central Valley Project Improvement Act as well as the CALFED Record of Decision (ROD).

NEPA/CEQA Requirements

Together, NEPA and CEQA require consideration of a range of alternatives to a proposed action that potentially could attain most of the basic project objectives and accomplish the project purpose and need while avoiding or minimizing environmental impacts. The purpose of including alternatives in an EIS/EIR is to offer a clear basis for choice by the decision-makers and the public as to whether and how to proceed with the proposed action. An EIS/EIR must also include a consideration of the No Action (NEPA) and No Project (CEQA) alternative.

NEPA Requirements

According to the Council on Environmental Quality NEPA regulations (Title 40 Code of Federal Regulations (CFR) § 1502.14), the alternatives section of an EIS is required to contain a rigorous exploration and objective evaluation of all reasonable alternatives, including the No Action Alternative. The discussion of alternatives must include sufficient information for a reasoned choice of the alternatives in terms of environmental aspects to be made. For alternatives that are not carried forward for detailed study, the EIS must include a brief discussion of the basis for this decision. NEPA requires substantial analysis of all the alternatives so that their merits can be compared (40 CFR 1502.14[b]).

CEQA Requirements

CEQA requires that an EIR include a discussion of the alternatives to enable an evaluation of whether there are other means of achieving the project's goals and objectives while avoiding or reducing the environmental effects of the project. The following contains excerpts from the CEQA Guidelines that set forth the requirements for describing and evaluating alternatives in an EIR.

> Section 15126.6(b) of the CEQA Guidelines states that:
>
> > "*...the discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or could be more costly*."
>
> Pursuant to Section 15126.6(d) of the CEQA Guidelines, an EIR must describe and evaluate a reasonable range of alternatives that could potentially attain most of the basic project objectives and would avoid or substantially lessen any of the significant impacts of the Proposed Project. Section 15126.6(f) of the CEQA Guidelines provides guidance on the extent of the alternatives analysis required:
>
> > *The range of alternatives required in an EIR is governed by a "rule of reason" that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project. The range of feasible alternatives shall be selected and discussed in a manner to foster meaningful public participation and informed decision-making.*
>
> As described under Section 15126.6(d) of the CEQA Guidelines:
>
> > *The EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project. A matrix displaying the major characteristics and significant environmental effects of each alternative may be used to summarize the comparison. If an alternative would cause one or more significant effects in addition to those that would be caused by the project as proposed, the significant effects of the alternative shall be discussed, but in less detail than the significant effects of the project as proposed*.
>
> Section 15126.6(e)(1) of the CEQA Guidelines also requires analysis of a "no project" alternative. The purpose of evaluating the No Project Alternative is to allow decision-makers to compare the potential consequences of the project with the consequences that would occur without implementation of the project.

CCWD Board Principles

The CCWD Board of Director's 2003 Resolution No. 03-24 and Measure N, approved by the CCWD voters on March 2, 2004 (CCWD, 2003) were both considered in developing alternatives. The resolution and measure contain a description of the conditions that must be met for the CCWD Board of Directors to consider approval of the reservoir expansion project.

> In Resolution No. 03-24 the CCWD Board determined that the District will not participate in or support the proposal for expansion of Los Vaqueros Reservoir unless the Board determines that the proposal meets the following conditions:
>
> 1. Improves drinking water quality for CCWD customers beyond that available from the existing Los Vaqueros Project;
> 2. Improves the reliability of water supplies for CCWD customers during droughts;
> 3. Enhances Delta habitat and protects endangered Delta fisheries and aquatic resources by installing state-of-the-art fish screens on all new intakes and creating an environmental asset through improved location and timing of Delta diversions and storage of water for environmental purposes;
> 4. Increases the protected land and managed habitat for terrestrial species in the Los Vaqueros Watershed and the surrounding region;
> 5. Improves and increases fishing, boating, hiking, and educational opportunities in the Los Vaqueros Watershed, consistent with the protection of water quality and the preservation of the watershed and the watershed's unique features;
> 6. CCWD continues as owner and manager of the Los Vaqueros Watershed;
> 7. CCWD maintains control over recreation in the Los Vaqueros Watershed;
> 8. CCWD continues as operator of the Los Vaqueros Reservoir system;
> 9. CCWD will be reimbursed for the value of the existing Los Vaqueros Project assets shared, replaced, rendered unusable or lost with the expansion project and said reimbursement will be used to purchase additional drought supply and water quality benefits or reduce debt on the existing Los Vaqueros Project;
> 10. Water rates for CCWD customers will not increase as a result of the expansion project.

Potential Project Participants and Interests

CCWD and Reclamation have worked with DWR and other potential project beneficiaries to develop and refine alternatives that would meet the project objectives in a cost effective way. Alternatives development has been guided by the following interests:

> **Federal** – The potential federal interest in the reservoir expansion project includes the protection and restoration of Delta fisheries, water supplies for environmental purposes, including fisheries and wetland habitat, and the reliability of Bay Area CVP contract supplies. The type and extent of federal interest will be determined by the appropriate decision makers based on the separate Federal Feasibility Report and other pertinent information.

State – The potential state interest in the reservoir expansion project includes the protection and restoration of Delta fisheries, water supplies for environmental purposes, and the reliability and quality of Bay Area SWP contract supplies. The type and extent of state interest will be determined by the appropriate decision makers based on the separate State Feasibility Report and other pertinent information.

Regional and Local – Should they choose to participate, the three South Bay water agencies' (Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7), Alameda County Water District (ACWD), and Santa Clara Valley Water District (SCVWD)) interest in the reservoir expansion project includes the protection and restoration of Delta fisheries and the reliability and quality of South Bay water supplies. The greater Bay Area interest in the project includes the addition of local emergency storage.

CCWD – CCWD's interest in the reservoir expansion is to maintain and expand the water quality benefits of the reservoir for its customers, gain water supply reliability benefits, and coordinate reservoir operations with federal and/or state water operations to protect and restore Delta fisheries and provide other environmental benefits.

Operational Parameters

Operational parameters drawn from CCWD's existing biological opinions and water rights permit also guided the alternatives development. The operational parameters, which are described below, were identified in order to contribute to the project objectives and meet the CCWD Board Principles for a reservoir expansion project while avoiding or minimizing impacts to other Delta water users including the CVP and SWP.

Operations and Delta Diversion

(1) Filling of the expanded Los Vaqueros Reservoir would occur during periods of low salinity with either surplus flows under existing water rights or with CVP and/or SWP existing supplies. Operations would be coordinated with SWP and CVP operations to minimize adverse impacts and to provide the project benefits.

(2) No water would be diverted through the Los Vaqueros intake system from the Delta during a 30-day no-diversion period in the spring. It is assumed that other Delta operational restrictions would not affect reservoir filling and direct deliveries outside of the no-diversion period.

The analysis presented in Section 4.3 and Appendix C demonstrates that operations under these assumptions, in conjunction with the use of positive-barrier fish screens and water quality limits on reservoir filling, would not cause adverse impacts on sensitive fish species.

Water Rights

None of the alternatives would involve diverting more water from the Delta than allowed under existing water rights or changing the ownership or priority of those water rights. The project would change the timing and location of diversions such that fish protection, environmental water management, and Bay Area water supply reliability would improve. In addition to its long-term contract with Reclamation, CCWD has separate water rights for the Los Vaqueros Reservoir. CCWD's separate Los Vaqueros water rights are subject to permit terms and conditions to ensure that exercising those water rights does not adversely affect the CVP and SWP operations under the water rights permits held by Reclamation and DWR, respectively. Under all alternatives, the use of the collective water rights of the project participants would be coordinated to operate the existing and new facilities in a manner designed to accomplish the project objectives without adversely affecting CVP and SWP operation. This would be achieved through agreements among the parties and permit changes as necessary.

Step 1: Initial Concepts

Initial concepts for achieving the project objectives were identified, evaluated, and screened during the first step of alternatives development. An initial concept was defined as any structural or non-structural action that would address one or more of the project objectives. The first step included the following:

- Develop a range of initial concepts, or resource management measures, that would potentially contribute to one or more of the project purposes.
- Develop initial screening criteria to identify whether a concept is likely to contribute to a project purpose and could be implemented, taking into consideration technical and legal constraints.
- Evaluate the concepts, using the initial screening criteria, to determine which concepts should be carried forward for further evaluation.

Additional factors in the selection of initial concepts were:

- The potential for a concept to address at least one project objective directly without adversely affecting other project objectives
- The potential for a concept to work in tandem with other concepts to address other project objectives
- Whether a concept had a geographic, operations, or physical relationship to problems and opportunities in the project study area.

The evaluation process of developing initial concepts is discussed in more detail in the *Initial Alternatives Information Report* (Reclamation, 2005), in which the initial concepts are referred to as resource management measures.

More than 30 initial concepts were identified as part of previous studies, programs, and projects, and through agency and consultant team meetings, field inspections, outreach, and environmental scoping activities. Throughout the alternatives development process, Reclamation and CCWD coordinated with local, state, and federal agencies through regular meetings of the Agency Coordination Work Group, which was established in 2002 after the Los Vaqueros Memorandum of Understanding was signed. Because the primary purpose of the reservoir expansion is to address problems and opportunities within the Delta and Bay Area regions, the geographic location of potential concepts was limited. Therefore, all concepts identified herein could be implemented within the project study area.

Initial Concept Screening

Concepts were rated on a scale of high to low based on their relative ability to address the primary and secondary project objectives. Most of the concepts that were rated as moderately, or less than moderately, addressing a project objective were deleted from further consideration, while concepts rated higher were retained. This distinction was imposed primarily because concepts that could only marginally address a project objective were generally found to be inconsistent with the planning constraints or other principles and criteria described above. For example, many of the concepts that could improve water supply reliability for a limited number of Bay Area water agencies would not eliminate the need for expansion of Los Vaqueros Reservoir. These concepts are not *alternatives* to the proposed project. In the long-term, improvements in water supply reliability will need to come from multiple sources in order to fully address the conditions affecting Bay Area agencies. Other major factors and rationale in retaining or deleting a concept are included in the following descriptions of the individual concepts.

Initial Concepts Addressing Water Supply Reliability

Table B-1 lists the initial concepts related primarily to addressing the Bay Area water supply reliability objective (one of the primary objectives) and the results of the evaluation of these concepts. **Figure B-1** shows the location of reservoirs that are referred to in the various concepts listed in Table B-1.

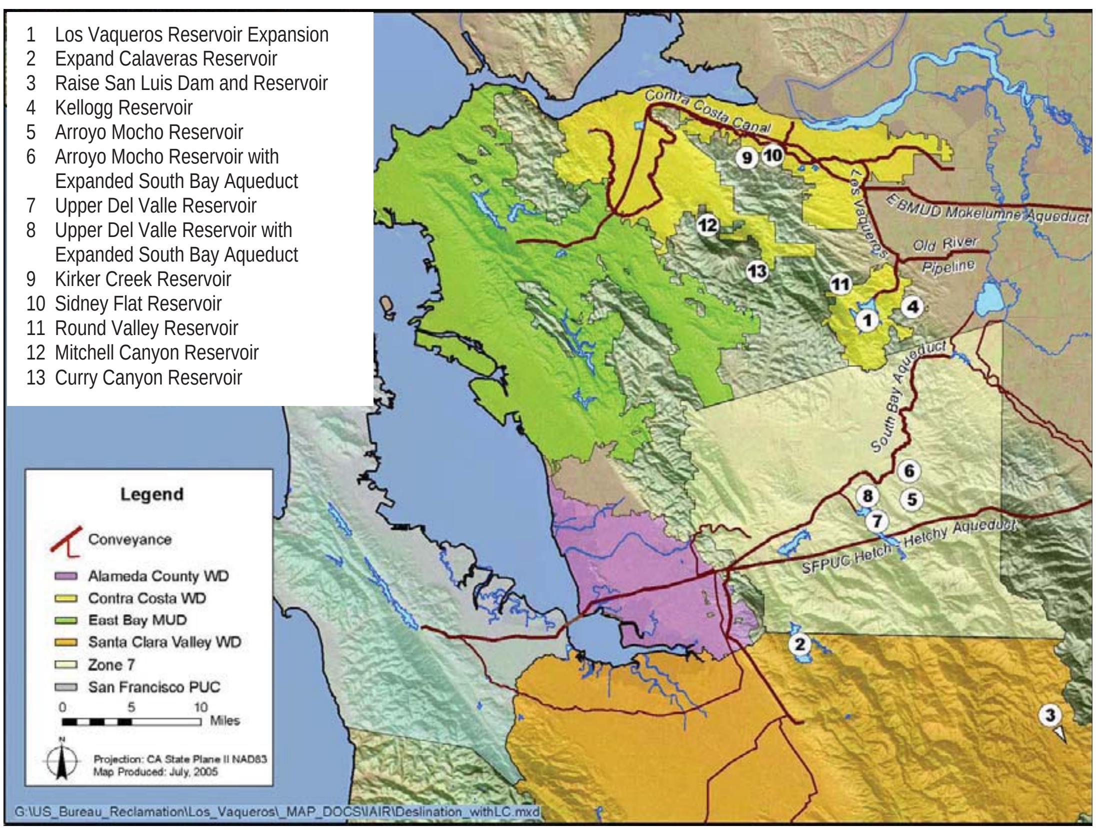

Figure B-1
Reservoir Storage Concepts Considered

TABLE B-1
INITIAL CONCEPTS ADDRESSING BAY AREA WATER SUPPLY RELIABILITY

Initial Concept	Potential to Address Project Objective	Status and Rationale
Surface Water Storage		
Enlarge Los Vaqueros Reservoir to increase conservation storage space (300 to 500 TAF total storage)	**High** – Could provide up to 400 TAF of new local storage for water supply reliability, and has potential to contribute to other project planning objectives	**Retained** – Specifically authorized for study; could contribute to other project planning objectives
Raise Los Vaqueros Dam In-Place to increase conservation storage space (115 to 275 TAF total storage)	**Moderate to High** – Could provide up to 175 TAF of new local storage for water supply reliability; has potential to contribute to other project planning objectives	**Retained** – Raising in-place potentially less costly than new enlarged dam; smaller increment of storage; could contribute to other project planning objectives
Raise Calaveras Dam to increase conservation storage space	**Low** – Could provide up to 320 TAF of local storage but would benefit only agencies with existing SFPUC contracts (ACWD and SCVWD)	**Deleted** – Low potential to provide regional water supply reliability benefits in the Bay Area
Enlarge San Luis Reservoir to increase conservation storage space	**Low** – Could provide up to 200 TAF but would serve only one agency (SCVWD)	**Deleted** – High unit cost; low potential to contribute to increasing regional Bay Area water supply reliability
Raise Pacheco Dam to increase conservation storage space	**Low** – Could provide up to 120 TAF but would serve only one agency (SCVWD)	**Deleted** – High unit cost; low potential to contribute to increasing water supply reliability in the project study area; limited potential to support other objectives
Construct new conservation storage at Upper Lake Del Valle Dam site	**Low** – Could capture up to 15 TAF local runoff, but effectiveness would depend on expansion of the SBA by DWR	**Deleted** – Effectiveness would depend on actions by others; low potential to provide regional benefits; high unit cost compared with other concepts
Construct other local area storage facilities considered as alternatives to the original Los Vaqueros Project	**Moderate** – Various sites could provide small to moderate increase in local storage	**Deleted** – Major site acquisition issues; high likelihood of local opposition; high unit cost
Construct new conservation storage in Sacramento River/San Joaquin River watersheds	**Low** – Various sites could provide small to moderate storage outside the project study area	**Deleted** – Low potential to address project planning objectives; most promising sites evaluated by ongoing CALFED studies
Construct new conservation storage in the Sacramento-San Joaquin Delta	**Low** – Uncertainty regarding ability to provide water supply reliability benefits to the project study area	**Deleted** – Low potential to address project planning objectives; most promising sites evaluated by ongoing CALFED studies
Reservoir System Reoperation		
Increase effective conservation storage space in existing Lake Del Valle Reservoir	**Low** – Small potential to provide water supply reliability benefits to the project study area without affecting other reservoir functions	**Deleted** – Low potential to provide regional water supply reliability benefits; high unit cost compared with other concepts
Improve Delta export and conveyance capability through coordinated CVP and SWP operations	**Low** – Limited potential for additional reoperation benefits beyond current plans	**Deleted** – Joint Point of Diversion and other system efficiency improvement concepts are being actively pursued in other programs

TABLE B-1 (Continued)
INITIAL CONCEPTS ADDRESSING BAY AREA WATER SUPPLY RELIABILITY

Initial Concept	Potential to Address Project Objective	Status and Rationale
Groundwater Storage		
Develop additional groundwater banking in San Joaquin River watershed	**Low** – Existing banks have sufficient capacity to store unused contract supplies; uncertainty regarding ability to secure additional supplies for banking and withdrawal limitations	**Deleted** – Existing Bay Area programs sufficient to store unused contract water; limited available capacity in current and planned banks
Develop additional groundwater banking in Sacramento River watershed	**Low** – Significant physical limitations to banking in Sacramento River watersheds	**Deleted** – Low likelihood of developing a reliable conjunctive-use program for Bay Area supplies in the Sacramento River basin due to significant physical, groundwater, and other related problems
Conveyance/System Modifications		
Increase Delta diversion capacity to Bay Area water agency facilities	**Moderate** – Increased export capacity could provide water supply reliability benefits, particularly in combination with storage	**Retained** – Additional Delta diversion capacity with enlarged capacity at existing site and/or new central Delta diversion likely to be effective when used in combination with reoperation and/or new storage
Construct intertie from SFPUC to the SBA	**Low** – Uncertainty regarding availability of Hetch Hetchy supplies and ability to provide regional benefits	**Deleted** – Low potential to contribute to overall water supply reliability conditions in the project study area; could be independently implemented; would have limited contribution to other project planning objectives
Expand use of Freeport Regional Water Project	**Low** – Little potential to improve water supply reliability because benefits would be limited to surplus project capacity during wet periods	**Deleted** – Very high capital and unit costs; benefits would be limited primarily to wet years
Increase Banks Pumping Plant capacity to greater than 8,500 cfs	**Low** – Limited potential to benefit water supply reliability in the project study area due to physical and regulatory constraints on increased exports	**Deleted** – Limited potential for increased water supply reliability in the project study area; limited potential to contribute to other project planning objectives
Construct an intertie from Los Vaqueros Reservoir to the SBA upstream from Dyer Canal	**Moderate** – Could provide water supply reliability benefits to South Bay water agencies with reoperation or expansion of Los Vaqueros	**Retained** – New conveyance from Los Vaqueros Reservoir to the SBA could be an important component of reservoir expansion action
Construct intertie from Los Vaqueros Reservoir to the SBA via Bethany Reservoir	**Low** – Although this measure could provide water supply reliability benefits to South Bay water agencies similar to the previously described Dyer Canal intertie, it would be much more costly because of increased pumping from Bethany Reservoir	**Deleted** – An SBA intertie at Bethany Reservoir was deleted as a measure for water supply reliability due to estimated high operations and maintenance costs; **Retained** – As a measure for plans focused on developing water supplies for environmental water management
Source Water Treatment Improvement		
Implement treatment/supply of agricultural drainage water	**Low** – Uncertain ability to treat agricultural runoff to a quality standard acceptable to the public	**Deleted** – Very costly; low certainty of success; likely low acceptability by stakeholders and general public

TABLE B-1 (Continued)
INITIAL CONCEPTS ADDRESSING BAY AREA WATER SUPPLY RELIABILITY

Initial Concept	Potential to Address Project Objective	Status and Rationale
Source Water Treatment Improvement (cont.)		
Construct desalination facility	**Moderate** – Potential to provide base water supply but would require storage to provide dry-year water supply reliability benefits	**Retained** – Limited application as a dry-year supply; high unit cost; potential environmental impacts from treatment byproducts; potential to provide benefits in combination with storage
Demineralize poor quality groundwater	**Low** – Limited groundwater resources in the project study area suitable for additional development; highly localized benefits	**Deleted** – High implementation costs; limited application and benefits; potential for adverse impacts to groundwater resources
Water Use Efficiency		
Implement additional wastewater reclamation	**Low** – Could provide localized water supply reliability benefits, limited by acceptable uses of recycled water	**Deleted** – Measure being actively pursued by other CALFED Programs and by individual agencies in the Bay Area
Implement additional demand management facilities	**Low** – Low potential to significantly address dry-year water supply reliability over and above existing/planned conservation programs	**Deleted** – Would not effectively address project planning objectives and constraints/criteria; features being actively pursued by other CALFED Programs and by individual agencies in the Bay Area[1]

ACWD = Alameda County Water District
Bay Area = San Francisco Bay Area
CALFED = CALFED Bay-Delta Program
cfs = cubic foot (feet) per second
CVP = Central Valley Project
DWR = Department of Water Resources
SBA = South Bay Aqueduct
SFPUC = San Francisco Public Utilities Commission
SCVWD = Santa Clara Valley Water District
SWP = State Water Project
TAF = thousand acre-feet

1 Ongoing conservation programs in Bay Area are included in the No Project/No Action Alternative

Initial Concepts Addressing Environmental Water Management

Table B-2 lists the initial concepts related primarily to addressing the environmental water management objective (one of the primary objectives) and the results of the evaluation of these concepts.

TABLE B-2
INITIAL CONCEPTS ADDRESSING ENVIRONMENTAL WATER MANAGEMENT

Resource Management Measure	Potential to Address Project Objective	Status and Rationale
Enlarge Los Vaqueros Reservoir to store environmental water supplies	**High** – Could store up to 400 TAF of surplus Delta flows or transfer water for environmental water management	**Retained** – High potential to provide water supplies for environmental water management
Raise Los Vaqueros Dam in-place to store environmental supplies	**High** – Could store up to 175 TAF of surplus Delta flows or transfer water for environmental uses	**Retained** – High potential to provide water supplies for environmental water management
Construct an intertie from Los Vaqueros Project to the SBA via Bethany Reservoir	**High** – Could be used to deliver replacement water supplies for the EWA or similar program. Most effective when combined with expanded storage in Los Vaqueros Reservoir and/or increased Delta intake capacity	**Retained** – Connection to the SBA could be an integral component in enlargement of Los Vaqueros for environmental water purposes; an intertie to Bethany Reservoir could also provide operational flexibility
Construct an intertie from Los Vaqueros Project to the SBA upstream from Dyer Canal	**Moderate to High** – Could be used to provide replacement supplies for the EWA or similar program, via delivery to the South Bay water agencies; most effective when combined with expanded storage at Los Vaqueros Reservoir	**Retained** – Connection to the SBA could be an integral component in enlargement of Los Vaqueros Reservoir; deliveries via this measure would be limited by the existing capacity of the SBA and demands of its users

Delta = Sacramento/San Joaquin River Delta
EWA = Environmental Water Account
SBA = South Bay Aqueduct
TAF = thousand acre-feet

Initial Concepts Addressing Water Quality

Table B-3 lists the initial concepts related primarily to the improving delivered water quality to the Bay Area (secondary objective). Of the five concepts that were identified, one was retained for possible inclusion in initial plans. Note that many of the initial concepts that address water supply reliability (Table B-1) also address improvements to water quality.

Initial Concepts Retained for Further Development

The initial concepts that were carried forward to the next step—initial plan development—are listed in **Table B-4**.

TABLE B-3
INITIAL CONCEPTS ADDRESSING WATER QUALITY

Resource Management Measure	Potential to Address Project Objective	Status and Considerations
Implement point-of-use water quality actions	**Low** – Difficult to implement over the entire project study area	**Deleted** – Likely very high costs to implement and maintain; marginal benefits
Rehabilitate Franks Tract for water quality improvement	**Moderate** – Some potential to improve water quality during certain periods at some existing Delta diversions	**Deleted** – Being pursued by others; unlikely to contribute to other project planning objectives
Cover open channel sections of the SBA	**Moderate** – Would benefit the South Bay water agencies during certain periods	**Deleted** – Low potential to contribute to other project planning objectives; could be pursued independently
Improve Bay Area water treatment plants	**High** – Potential to significantly improve treatment processes and delivered water quality	**Deleted** – Low potential to contribute to other project planning objectives; could be pursued independently by individual agencies
Reoperate an enlarged Los Vaqueros Reservoir or other project study area systems to improve water quality	**High** – Potential to improve water quality for CCWD and the South Bay water agencies, particularly combined with enlarged diversion and storage capacity	**Retained** – High potential to address area water quality conditions; could contribute to other project planning objectives

Bay Area = San Francisco Bay Area
CCWD = Contra Costa Water District
Delta = Sacramento-San Joaquin Delta
SBA = South Bay Aqueduct

Bay Area Water Conservation

As described above, initial concepts related to water use efficiency, such as additional water conservation and recycled water use, were not carried forward beyond Step 1. In general, substantial programs are already in place at each Bay Area water agency to improve water use efficiency. Additional efforts in these concepts would not contribute to the two primary objectives defined for the project: environmental water management and water supply reliability. Further reducing Bay Area water agency demand for Delta water would result in a very small decrease in Delta diversions and the associated environmental water benefit. Additional water conservation without storage to hold water for dry years would provide little benefit in dry years and reduce the effectiveness of drought management (rationing) programs that most Bay Area water agencies would rely on to maintain deliveries through extended drought periods.

The Bay Area water agencies have extensive water conservation and efficiency programs in place that are considered part of the No Project/No Action Alternative. Even though the population of the Bay Area has increased nearly 17 percent since 1986, water use has actually decreased by 1.4 percent during the same period. During the drought period from 1987 to 1992, Bay Area conservation measures helped reduce water use by more than 20 percent. Despite continued growth since then, overall water use remains below pre-drought levels (BAWAC, 2003).

TABLE B-4
INITIAL CONCEPTS RETAINED

Project Objectives	Resources Management Measure Retained	
Primary Objectives		
Bay Area Water Supply Reliability	Enlarge Los Vaqueros Reservoir	Increase conservation storage space in Los Vaqueros Reservoir by up to 400 TAF through removing and replacing the existing dam with a substantially larger facility
	Raise Los Vaqueros Dam in-place	Raise the height of the existing Los Vaqueros Dam to increase conservation storage space by up to 175 TAF
	Increase Delta diversion capacity	Increase the capacity of Delta diversion(s) to Bay Area water agencies
	Construct an intertie from Los Vaqueros Project to the SBA upstream from Dyer Canal	Construct new conveyance to deliver water from Los Vaqueros Reservoir to the SBA upstream from Dyer Canal
	Construct desalination plant	Develop desalination facility, drawing from Bay-Delta Estuary and associated conveyance facilities
Environmental Water Management	Enlarge Los Vaqueros Reservoir	Enlarge Los Vaqueros Reservoir by up to 400 TAF to store surplus Delta flows for environmental use
	Raise Los Vaqueros Dam In-Place	Raise the height of the existing Los Vaqueros Dam, increasing storage by up to 175 TAF, to store surplus Delta flows for environmental use
	Construct an intertie from Los Vaqueros Project to the SBA via Bethany Reservoir	Construct a new pipeline to deliver environmental supplies from the Los Vaqueros Project to Bethany Reservoir
	Construct an intertie from Los Vaqueros Project to the SBA upstream from Dyer Canal	Construct new conveyance to deliver water from Los Vaqueros Reservoir to SBA upstream from Dyer Canal
Secondary Objective		
Bay Area Water Quality	Reoperate reservoir/delivery	Reoperate an enlarged Los Vaqueros Reservoir and/or delivery system to improve delivered water quality

Bay Area = San Francisco Bay Area
Bay-Delta Estuary = San Francisco Bay/Sacramento-San Joaquin Delta Estuary
Delta = Sacramento-San Joaquin Delta
SBA = South Bay Aqueduct
TAF = thousand acre-feet

The Bay Area water agencies plan to continue conservation efforts into the future. The agencies plan to save 150 thousand acre-feet (TAF) per year from a variety of conservation measures, including plumbing retrofits, rebates for efficient toilets and appliances, and residential, commercial and industrial surveys and incentives. As the agencies implement these conservation measures, the flexibility to further reduce water use in dry periods is lost. For example, with a 5-gallon-per-flush toilet, users could install a displacement device in the toilet during dry years to reduce use. Today and in the future, with more 1.6-gallon-per-flush toilets installed, there is little ability to reduce water use for toilet flushing. Similarly, with more xeriscape plants and efficient landscape irrigation installed, the water savings in dry years from reduced landscape irrigation is less. (BAWAC, 2003).

Step 2: Initial Plans

In Step 2, the initial concepts retained from Step 1 were used in combination to develop the initial plans, which were then evaluated per the project objectives, purpose, need, principals, and guidelines described above. Because a large array of potential concept combinations and sizes existed, the approach was not to develop an exhaustive list of all possible plans or to optimize outputs. Rather, the purpose was (1) to explore different strategies to address the planning objectives, constraints, principles, and criteria, and (2) to identify initial plans that may warrant further development into comprehensive alternatives.

The plans described in this chapter represent a range of potential actions to address the project objectives. The initial plans focused on a single primary objective, either the environmental water management or Bay Area water supply reliability. A third set of plans included a mixture of concepts to address all of the planning objectives, referred to as "combined objective plans."

Overview of Initial Plans

The retained initial concepts were packaged into eight initial plans formulated to facilitate comparison of a broad range of potential actions. The initial plans were not complete alternatives but represented fundamentally different ways of combining the retained initial concepts to address specific objectives. The initial plans are shown in **Table B-5**, organized by the objective(s) the plan is designed to meet.

Facilities Associated with Enlarging Los Vaqueros Reservoir

Three major components were associated with enlarging Los Vaqueros Reservoir for the purpose of either increasing Bay Area water supply reliability or providing environmental water supplies:

- Constructing new and modifying existing Delta intake(s), pumping, and conveyance facilities to the reservoir, and constructing a small balancing reservoir
- Raising Los Vaqueros Dam and increasing the size of Los Vaqueros Reservoir
- Constructing pumping and transmission facilities from Los Vaqueros Reservoir to the SBA or Bethany Reservoir

During this step, a variety of potential reservoir sizes was considered and represented increases in the current capacity of 25 TAF to 400 TAF. The 25-TAF increase corresponded to a dam raise of about 15 feet, the estimated maximum height the existing structure could be raised without major reconstruction. It was projected that larger dam raises would require removal of the existing dam and construction of a new dam a short distance from the existing facility.

TABLE B-5
SUMMARY OF INITIAL PLAN FEATURES

Initial Plans	Initial Concepts: Raise Los Vaqueros Dam in place	Enlarge Los Vaqueros Reservoir	Enlarge Delta Pumping/ Conveyance	Los Vaqueros with Dyer Canal Intertie	Los Vaqueros-Bethany Res. Intertie	Desalination Plant	Water Quality Reoperation
Bay Area Water Supply Reliability Focus							
1. Raise Los Vaqueros Dam In-Place	✔		✔	✔			
2. Enlarge Los Vaqueros Reservoir		✔	✔	✔			
3. Desalination with Storage (Enlarge Los Vaqueros Reservoir)		✔	✔	✔		✔	
Environmental Water Management Focus							
4. Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie		✔	✔	✔			
5. Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie		✔	✔		✔		
Combined Objective Focus							
6. Water Supply Reliability/Improved Environmental Water Management Combination with Dyer Canal Intertie		✔	✔	✔			
7. Water Supply Reliability/Improved Environmental Water Management Combination with Bethany Reservoir Intertie		✔	✔		✔		
8. Water Supply Reliability/Improved Environmental Water Management Combination with Water Quality Improvements		✔	✔	✔			✔

Initial Plans Focused on Bay Area Water Supply Reliability

Three initial plans focus on improving water supply reliability for Bay Area water agencies. These initial plans represent three fundamentally different strategies to address the water supply reliability objective using various combinations of the retained concepts: a small dam raise strategy, a major reservoir expansion strategy, and a regional desalination strategy. Because the plans that focus on Bay Area water supply reliability also include diverting water from the Delta during surplus flow conditions, when water quality is typically good, the plans also would provide water quality benefits.

1 – Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability

The focus of this initial plan is on increasing water supply reliability through a small raise of the existing Los Vaqueros Dam. Initial studies indicate that the existing dam could be raised by as much as 15 feet, without major reconstruction, to create up to 25 TAF of additional storage. Diversion and conveyance capacity from the Delta to the enlarged reservoir would be increased by maintaining the existing pumping capacity at Old River of 250 cubic feet per second (cfs) and constructing an additional diversion and pumping facility in the central Delta of about 500 cfs. Total Delta diversion capacity under this initial plan would be about 750 cfs. Conveyance facilities including a pump station near the outlet of the expanded reservoir and a pipeline to the SBA near the Dyer Canal Back Surge Pool would be constructed.

The additional storage would improve dry-year water supply reliability for Bay Area water agencies, including CCWD and the South Bay water agencies. The increase in Delta diversion capacity identified for this initial plan was selected because it appeared to result in the lowest cost per unit of increased water yield of the diversion capacities considered.

2 – Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability

This initial plan includes an expansion of Los Vaqueros Reservoir to 500 TAF. It would require demolishing the existing dam and constructing a larger dam capable of storing as much as 400 TAF in addition to the existing 100-TAF Los Vaqueros Reservoir (total storage of 500 TAF). Similar to Initial Plan 1, surplus Delta flows would be conveyed to the expanded reservoir, and water would be delivered to SBA through a new pump station, pipeline, and intertie to the Dyer Canal. This plan would improve dry-year water supply reliability for CCWD and the South Bay water agencies. The facility sizes selected for this initial plan were shown in preliminary operations modeling to more efficiently contribute to the primary objective of water supply reliability than other sizes evaluated.

3 – Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability

The focus of this initial plan is on increasing water supply reliability through construction of a new regional water desalination facility in the Bay Area in combination with new storage and delivery facilities. For purposes of this initial plan, the plant was assumed to be a single brackish water desalination plant located at, or near, the Mirant Pittsburgh site identified by the Bay Area Regional Desalination Project. New conveyance facilities would include transmission facilities from the desalination plant to the existing CCWD Neroly Blending Facility and a pumping station and pipeline from that location to Los Vaqueros Reservoir.

Los Vaqueros Dam would be reconstructed and enlarged to store as much as 500 TAF and the diversion and conveyance capacity from the Delta to Los Vaqueros Reservoir would be increased from 250 cfs (existing at Old River) to 750 cfs (total capacity). Similar to previous plans, deliveries would be made from Los Vaqueros Reservoir to the SBA via a new pump station, pipeline, and intertie to the Dyer Canal.

Initial Plans Focused on Environmental Water Management

Two initial plans were formulated to address the primary project objective of developing water supplies for environmental water management. Each includes diverting surplus flows from the Delta to an expanded Los Vaqueros Reservoir and constructing delivery facilities to CVP and SWP water users affected by environmental water pumping curtailments. The facilities associated with these plans would generally be similar to those described for Initial Plan 2. In both of the environmental water-focused initial plans, deliveries would be made to the SBA from the expanded reservoir facilities; the resulting pumping reductions at the CVP and SWP Delta pumping plants then could be used either to deliver environmental water supplies south of the Delta or to directly accommodate environmental fish actions (pumping curtailments) at the export facilities. At this stage of alternatives development, environmental benefits were primarily seen as resulting from using the enlarged Los Vaqueros Reservoir and related facilities in conjunction with the CALFED Environmental Water Account (EWA) Program, or a similar program that provided water for environmental uses while keeping municipal, industrial and agricultural water users whole. As the alternatives development process progressed, and the long-term status of the EWA became uncertain, the alternatives were refined to provide a broader base of environmental water management benefits that are described in Chapter 3 and Sections 4.2 and 4.3 of the Draft EIS/EIR. The evaluation of alternatives at the Initial Plan step included comparisons of how effectively an alternative provides EWA or EWA-like benefits as shown in Table B-2 Initial Concepts Addressing Environmental Water Management and Table B-6 Summary Comparison of Initial Plans.

Initial Plans 4 and 5, described below, are similar; however, the first delivers water from Los Vaqueros Reservoir to the SBA near the Dyer Canal Back Surge Pool, and the second delivers water to Bethany Reservoir.

4 – Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie for Improved Environmental Water Management

This plan is focused on providing water supply for environmental water management through expanding the existing Los Vaqueros Reservoir by as much as 400 TAF (to 500 TAF total) and constructing an intertie between the expanded reservoir and the SBA at the Dyer Canal. Delta diversion and conveyance facilities would be enlarged to fill the expanded reservoir during periods of surplus Delta flow; these supplies would be delivered to the SBA in lieu of CVP and SWP deliveries that could then be used for environmental purposes. The pump station would lift water from the expanded reservoir through a pipeline to the Dyer Canal segment of the SBA.

5 – Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie for Improved Environmental Water Management

This initial plan is similar to Initial Plan 4 except that water would be delivered either from the expanded reservoir or directly from enlarging Delta pumping and conveyance facilities to the SWP Bethany Reservoir. Supplies delivered to Bethany from the expanded reservoir via a gravity intertie then would be pumped to the SBA via the existing South Bay Pumping Plant or through the California Aqueduct for other environmental water purposes (such as storage in San

Luis Reservoir). A flow separation structure could prevent higher quality Los Vaqueros supplies delivered to the SBA from mixing with lower quality Bethany Reservoir supplies. Unlike Initial Plan 4, the capacity and demands of the SBA would not restrict environmental water deliveries under this initial plan; additional environmental water supplies could be conveyed south via the California Aqueduct.

Initial Plans Focused on Combined Objectives

Three initial plans were formulated from the retained concepts to address multiple project objectives. The three initial plans provide both water supply reliability and environmental water management benefits. The third plan was also formulated to provide additional water quality benefits. The initial plans all consist of enlarging/reconstructing Los Vaqueros Reservoir to 500 TAF, enlarging associated Delta diversion and conveyance facilities primarily for the purposes of increasing water supply reliability, and developing environmental water supplies.

6 – Water Supply Reliability / Improved Environmental Water Management Combination with Dyer Canal Intertie

This initial plan would provide water supply reliability benefits and improve environmental water management through enlarging the existing Los Vaqueros Reservoir by as much as 400 TAF (to 500 TAF) in combination with a new intertie to the Dyer Canal segment of the SBA. Delta diversion and conveyance capacity would be increased to supply the enlarged reservoir with surplus Delta flows. A portion of the additional storage space would be dedicated to improving dry period water supply reliability for CCWD and the South Bay water agencies, and the remainder would be dedicated to environmental purposes.

7 – Water Supply Reliability / Improved Environmental Water Management Combination with Bethany Reservoir Intertie

Similar to Initial Plan 6, this plan would provide water supply reliability benefits and improve environmental water management. A new intertie would connect the expanded reservoir with Bethany Reservoir. Existing facilities would be used to deliver water supplies from Bethany to CVP and SWP users on the SBA. Unlike Initial Plan 6, the capacity of demands of the SBA would not limit the amount of environmental water supplies that could be developed under this plan.

8 – Water Supply Reliability / Improved Environmental Water Management Combination with Water Quality Improvements

This initial plan would focus on providing water supply reliability and water quality improvements and improved environmental water management. Facilities would be similar to the combined objective Initial Plan 6, including increased Delta diversion and conveyance capacity to the expanded reservoir and an intertie to the Dyer Canal segment of the SBA. Portions of the new storage space in Los Vaqueros Reservoir would be dedicated to Bay Area water supply reliability and environmental water management purposes similar to the previous plans. However, unlike

Initial Plan 6, the reservoir would be operated to provide additional water quality benefits for Bay Area water agencies.

Evaluation of Initial Plans

Federal Economic and Environmental Principles and Guidelines

To help focus the plan formulation process and develop the most appropriate detailed plans to be considered for implementation, the eight initial plans were compared using four general criteria - completeness, effectiveness, efficiency, and acceptability - based on the federal P&Gs as described above.

Completeness. Completeness is a determination of the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of planned effects. Each alternative is given a completeness ranking ranging from low to high, depending primarily on the degree of uncertainty (or reliability) of achieving the intended objectives and adequately mitigating significant adverse impacts.

Effectiveness. Effectiveness is the extent to which an alternative plan would alleviate problems and achieve objectives. For example, in the case of water supply reliability or water quality objectives, effectiveness may be considered in terms of a measured increase in water supply reliability or the ability to achieve a specific water quality goal, respectively.

Efficiency. Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating specified problems and realizing specified opportunities, consistent with protecting the nation's environment. Some potential ways to evaluate efficiency include comparing dollars per unit of economic benefit, least-cost of attaining a given objective, and lower opportunity cost relative to the accomplishment of other alternatives.

Acceptability. Acceptability is the workability and viability of the alternative plan with respect to acceptance by state and local entities and the public, and compatibility with existing laws, regulations, and public policies. Acceptability may be evaluated according to a plan's ability to be implemented within existing laws and policies; consistency with stated project principles; or the potential for broad-spectrum acceptance or support.

Costs, implementation costs, and annual costs of the initial plans were also evaluated. The facility sizes represented in the initial plans were selected to provide a level basis for comparing the plans while also considering apparent trends in the cost effectiveness of various facility combinations.

Table B-6 shows the results of the evaluation of the initial plans.

TABLE B-6
SUMMARY COMPARISON OF INITIAL PLANS

Initial Plans	Comparison Criteria: Completeness	Effectiveness	Efficiency	Acceptability	Further Development Status and Overall Ranking
Bay Area Water Supply Reliability Focus					
1 – Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability	Could be physically implemented with minimal impacts; would not require future elements; would be consistent with study authorization; and would address water supply reliability objective.	Potential to provide nearly 30 percent of the 2020 drought period shortages for Bay Area water agencies.	Lowest implementation cost but lower drought period yield. Low cost per unit of output compared with other plans focused on water supply reliability.	Consistent with goals of CALFED.	Although lower yield, **retained** for further development because of very low implementation cost.
	High	*Low*	*Moderate*	*High*	*Moderate*
2 – Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address water supply reliability objective.	Potential to provide almost 65 percent of the 2020 drought period shortages for Bay Area water agencies.	Moderate yield but higher cost per unit of output for water supply reliability than Initial Plan 1.	Consistent with goals of CALFED.	**Retained** for further development because of potential to significantly address water supply reliability for Bay Area.
	High	*Moderate*	*Moderate*	*High*	*Moderate-High*
3 – Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability	Could be physically implemented; would be consistent with study authorization; and would address water supply reliability objective. Increased uncertainty relating to reliability and efficiency to implement and maintain desalination facilities and mitigate for brine disposal impacts.	Potential to provide about 75 percent of the 2020 drought period shortages for Bay Area water agencies.	Highest yield but also the highest cost per unit of output for water supply reliability.	Consistent with goals of CALFED; may be difficult to mitigate byproducts (brine) to a level acceptable to other Bay Area water resources interests.	**Deleted** from further development as a stand-alone alternative primarily because of highest cost per unit of water supply developed of any plan considered and because of inability to further other project objectives.
	Moderate	*Moderate*	*Low - Moderate*	*Moderate*	*Low-Moderate*
Environmental Water Management Focus					
4 – Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie for Improved Environmental Water Management	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address the environmental water management objective.	Potential to replace more than 60 percent of average annual EWA water acquisition target.	Moderately high cost per unit of output for relatively low environmental water supply.	Consistent with goals of CALFED; potential for federal interest in the environmental water management objective.	**Retained** for further development, although at this time, does not appear to be as efficient as Initial Plan 5 (with intertie to Bethany Reservoir).
	High	*Low-Moderate*	*Moderate*	*Moderate-High*	*Moderate*
5 – Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie for Improved Environmental Water Management	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address the environmental water management objective.	Potential to replace about 85 percent of average annual EWA water acquisition target.	Moderate cost per unit of output for environmental water supply and highest yield of the initial plans.	Similar to Initial Plan 4.	**Retained** for further development primarily because it would result in the largest potential environmental water supply.
	High	*Moderate-High*	*Moderate*	*Moderate-High*	*Moderate-High*

TABLE B-6 (Continued)
SUMMARY COMPARISON OF INITIAL PLANS

Initial Plans	Comparison Criteria				Further Development Status and Overall Ranking
	Completeness	Effectiveness	Efficiency	Acceptability	
Combined Objectives Focus					
6 – Water Supply Reliability/Improved Environmental Water Management Combination with Dyer Canal Intertie	Could be physically implemented; would not require future elements; would be consistent with study authorization; and would address primary objectives.	Potential to provide more than 20 percent of the 2020 drought period shortages for Bay Area water agencies and replace more than 60 percent of average annual EWA water acquisition target.	Relatively low drought period yield and EWA replacement supplies with low to moderate cost per unit of output for both water supply reliability and EWA.	Consistent with goals of CALFED; potential for federal interest in environmental water management objective.	Although relatively low yields, **retained** for further development because of low to moderate costs per unit of output for both supply reliability and environmental water supply.
	High	*Moderate*	*Moderate-High*	*High*	*High*
7 – Water Supply Reliability/Improved Environmental Water Management Combination with Bethany Reservoir Intertie	Could be physically implemented; would not require future elements; could be consistent with study authorization; and would address primary objectives.	Potential to provide about 15 percent of the 2020 drought period shortages for Bay Area water agencies and replace nearly 80 percent of average annual EWA water acquisition target.	Similar to Initial Plan 6.	Similar to Initial Plan 6.	**Retained** for further development primarily because it would result in the lowest cost for environmental water supply, and high potential for federal interest.
	High	*Moderate-High*	*Moderate-High*	*High*	*High*
8 – Water Supply Reliability/Improved Environmental Water Management Combination with Water Quality Improvements	Could be physically implemented; would not require future elements; reduced certainty of improving water quality conditions under all circumstances; would be consistent with study authorization; and would address all objectives.	Potential to provide nearly 30 percent of the 2020 drought period shortages for Bay Area water agencies and replace about 40 percent of average annual EWA water acquisition target. Also would provide a significant improvement in SBA water quality.	Overall highest cost per unit of water supply reliability and EWA replacement output of combination plans considered.	Consistent with plan in CALFED ROD; potential for federal interest.	**Retained** for further development primarily because it would be consistent with the plan in the CALFED ROD and balance project objectives.
	High	*Moderate*	*Low-Moderate*	*High*	*Moderate-High*

KEY: Bay Area = San Francisco Bay Area
CALFED = CALFED Bay-Delta Program
EWA = Environmental Water Account
ROD = Record of Decision
SBA = South Bay Aqueduct

Initial Plans Selected

After evaluating each initial plan per the planning criteria and analyses described above, seven plans were selected for further investigation. Initial Plan 3 (Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability) was not selected for further development as a stand-alone alternative due primarily to higher construction and operations costs. Energy costs for operating a desalination facility are highly variable and sensitive to market changes. Additionally, desalinated water stored in the reservoir for later use would require a re-treatment process before being delivered to Bay Area water agencies. The environmental impacts of a desalination facility were also somewhat prohibitive because of the large quantity of brine waste and increased water temperature, which would be introduced into the Delta environment, resulting in biological impacts. As outlined in the Other Initial Plan Analyses section below, desalination without new storage was considered but not moved forward for various reasons.

The seven initial plans (plus No Project/No Action) that were selected for more detailed evaluation are:

- **No Project/No Action.** No further action would be taken by Reclamation and CCWD to resolve the identified water resources problems and needs in the project study area.
- **1 – Raise Los Vaqueros Dam In-Place for Bay Area Water Supply Reliability.** Raise the existing Los Vaqueros Dam in-place with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal, primarily to improve Bay Area water supply reliability during dry periods.
- **2 – Enlarge Los Vaqueros Reservoir for Bay Area Water Supply Reliability.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal, primarily to improve Bay Area water supply reliability during dry periods.
- **4 – Enlarge Los Vaqueros Reservoir with Dyer Canal Intertie for Improved Environmental Water Management.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal, primarily to develop environmental water replacement supplies.
- **5 – Enlarge Los Vaqueros Reservoir with Bethany Reservoir Intertie for Improved Environmental Water Management.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with Bethany Reservoir, primarily to develop environmental water supplies.
- **6 – Water Supply Reliability / Improved Environmental Water Management Combination with Dyer Canal Intertie.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal to improve Bay Area water supply reliability and develop environmental water supplies.
- **7 – Water Supply Reliability / Improved Environmental Water Management Combination with Bethany Reservoir Intertie.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with

Bethany Reservoir to improve Bay Area water supply reliability and develop environmental water supplies.

- **8 – Water Supply Reliability / Improved Environmental Water Management Combination with Water Quality Improvements.** Reconstruct and enlarge Los Vaqueros Reservoir with increased Delta diversion and conveyance capacity and an intertie with the SBA at the Dyer Canal to improve Bay Area water supply reliability, develop environmental water supplies, and improve the quality of delivered water supplies.

Other Initial Plan Analyses

Moderate In-Place Dam Raise (275-TAF Reservoir Expansion)

In September 2006, taking into consideration engineering studies and analyses and further refinement of the operations modeling and cost estimates, it was determined that a reservoir expansion to 275 TAF was the preferred reservoir expansion size.

Engineering studies and analysis determined that it would be possible to raise the existing dam in-place to achieve a moderate reservoir expansion of up to 275 TAF total capacity, versus the initial plans for either a mini in-place dam raise (up to 115 TAF total capacity) or a major reservoir expansion (up to 500 TAF total capacity, requiring demolition of the existing dam). This dam raise scenario has the potential for cost savings over large expansion scenarios because portions of the existing dam structure, inlet/outlet, and associated facilities could be preserved, and a portion of the foundation of the existing dam left intact. Dewatering the reservoir would be required during construction, similar to the major reservoir expansion scenarios.

The *Initial Economic Evaluation for Plan Formulation Report* considered the benefits and costs of a 275-TAF reservoir expansion, and the conclusion was reached that the alternative was potentially economically feasible (Reclamation, 2006). It included the following major facilities:

- Reconstruct the existing Los Vaqueros Dam in place to create a reservoir with a total capacity of 275 TAF.
- Expand the existing Old River Intake and Pump Station by 170 cfs to a total capacity of 420 cfs (note that the existing facility has a current capacity of 250 cfs and a planned build out capacity of 320 cfs, total).
- Construct new conveyance from the expanded Old River Intake and Pump Station to the existing Transfer Facility, and from the existing Transfer Facility to the expanded reservoir
- Enlarge the Transfer Facility balancing reservoir and increase Transfer Facility pumping capacity.
- Construct a new pump station, pipeline, and delivery intertie to connect Los Vaqueros Reservoir to the SBA upstream from Dyer Canal.

Larger (than 275-TAF) reservoir expansion options up to 500 TAF were eliminated by subsequent operational analyses that determined that Bay Area water supply reliability demands and environmental water demands did not warrant the higher cost associated with demolishing the existing dam and building a new facility. Operational analyses also indicated that the volume of new storage would not be the sole limiting factor in developing environmental water management benefits. Availability of Delta surplus, potential restrictions on Delta pumping due to water quality or fisheries impacts, timing and location needs for environmental water, potential SBA water supply reliability beneficiaries, and availability of space for environmental water in storage facilities south of the Delta would all exert influence on project operations and yield. As a result, the comprehensive plans described in the next section do not consider expansion of Los Vaqueros Reservoir to greater than 275 TAF.

Desalination without New Storage

Although Initial Plan 3 (Desalination with Storage (Enlarge Los Vaqueros Reservoir) for Bay Area Water Supply Reliability) was dropped from the eight initial plans (see Initial Plans Selected section above), it was thought that desalination could still be a viable alternative component. Consequently, a scenario was identified that would involve constructing a new, brackish water desalination plant drawing water from Mallard Slough and located adjacent to the existing Randall-Bold Water Treatment Plant. Potential benefits/accomplishments were:

- High quality water from the desalination plant to enable CCWD to meet water quality goals in lieu of receiving water supplies from Los Vaqueros Reservoir.
- Desalinated supplies blended with other CCWD supplies in a manner similar to existing conditions.
- Storage space in Los Vaqueros Reservoir (that would otherwise have been exercised to meet CCWD water quality goals) used instead to contribute to environmental water management and Bay Area water supply reliability objectives.
- New intertie, either to Bethany Reservoir or to the SBA upstream from Dyer Canal, to deliver supplies from the reservoir to beneficiaries.

However, through assessment of CCWD’s service area and examination of existing infrastructure, it was determined that only about 30 percent of CCWD’s demand on Los Vaqueros Reservoir could be offset. After accounting for the emergency storage space that CCWD reserves in the reservoir (40 TAF in dry and critical years and 70 TAF in all other year types), the resulting capacity made available by the desalination facility would be about 10 TAF to 15 TAF, depending on year type—not enough to provide sufficient environmental water management benefit to offset the significant cost of construction and operation. In addition, disposal of concentrated brine waste from the desalination facility (both in terms of the facilities that would be needed to transport the waste and the potential environmental impacts to the receiving estuary) and potential greenhouse gas issues posed challenges. Therefore, it was determined that the desalination without new storage scenario would not be carried forward for further development as an alternative.

Although desalination facilities were not carried forward as an alternative for the reservoir expansion project, the Bay Area water agencies continue to evaluate a regional desalination facility at this location to meet long-term, dry-year water supply reliability needs. This project, the Bay Area Regional Desalination Project, is a cooperative effort of East Bay Municipal Utility District, SFPUC, SCVWD, and CCWD. While not yet shown to be potentially feasible, such a project may prove feasible in the future, and could complement an expanded Los Vaqueros Reservoir.

Step 3: Alternatives Development and Refinement

As described above, a number of initial concepts were identified and used to formulate a range of initial plans addressing the project planning objectives. The initial plans that were chosen to move forward from Step 2 were selected because of their ability to contribute to the primary project objectives: providing environmental water management benefits and/or Bay Area water supply reliability. The initial plans carried forward from Step 2 eliminated all reservoir size options greater than expansion to 275 TAF. Plans that took into consideration multiple Delta intakes and conveyance options, as well as multiple delivery options to Dyer Canal or Bethany Reservoir, were carried forward.

The initial plans were further evaluated against the planning principles and guidelines established for the project, and additional studies and operations modeling efforts were simultaneously conducted. During evaluation and comparison of the initial plans, various combinations of components, configurations, and operations were identified for further development in detailed alternative plans.

Specifically, the sizing of project intakes, conveyance, and pumping facilities considering operations, benefits, adverse impacts, and costs were evaluated. During this step, it was determined that the South Bay Connection at Bethany Reservoir provided greater potential project benefits than the connection to Dyer Canal. In addition the costs and environmental impacts of the connection to Dyer Canal were greater than those for the connection to Bethany Reservoir. Therefore, the connection to Dyer Canal was dropped from further consideration. All alternatives that include a connection to South Bay water agencies also include the South Bay Connection to Bethany Reservoir.

Additional Plans Considered

Two specific alternative plans were developed and evaluated during this step including a conveyance-only alternative, which was not carried forward as a final alternative, and a smaller 160-TAF reservoir expansion alternative, which is included in the final alternatives evaluated in the Draft EIS/EIR.

Conveyance-only Plan

This plan includes construction of a new intake on Old River, new conveyance facilities from the Delta to the Transfer Facility, and a new pipeline to deliver supplies from the Transfer Facility to Bethany Reservoir. Los Vaqueros Reservoir would not be expanded. Operation of these facilities would provide some environmental water management benefit by moving water to Bethany through screened diversions, which could also improve water supply reliability to South Bay water agencies by avoiding the CVP and SWP Delta pumps, and could be used to move surplus Delta supplies to Central Valley refuges. However, without the operational flexibility and greater certainty of storage these benefits are limited. Under this plan, there would be less environmental water management benefits and limited water supply reliability benefits compared to alternatives including expansion of Los Vaqueros Reservoir.

This plan was not carried forward as a final alternative because it did not contribute substantially to one of the primary project objectives, providing Bay Area water supply reliability and had less environmental water management benefits. The plan was also the least consistent with the CCWD Board Principles and with the water management objectives set forth in the CALFED ROD. The plan was found to have the least potential for local agency participation.

160-TAF Reservoir Plan

During this review, a new plan was considered that would facilitate CCWD's future plans to secure water transfers for CCWD customers providing supplemental dry-year water supply and reducing the extent of supplemental drought supply acquisition required. CCWD would increase the size of Los Vaqueros Reservoir to 160 TAF. This alternative could be implemented solely by CCWD and specifically addresses water supply reliability planning objectives without requiring new intake or conveyance facilities. This alternative was further refined as a smaller reservoir alternative that could serve CCWD customers and other Bay Area water agencies through existing interties. This alternative was carried forward as a final alternative.

Facilities Siting

In addition to developing and refining project alternatives, alternative facility sites were identified and evaluated for the intake, conveyance, and recreation facilities associated with the alternatives. The purpose of the siting studies was to help define the alternatives, identify location constraints, outline the areas to be evaluated in the EIS/EIR, and potentially avoid environmental impacts. The facilities siting process is described briefly here. Additional information is available in the *Facilities Siting Report* (ESA, 2007).

A number of sources were used to complete the facilities siting analysis, including published literature, recent aerial photographs, geology, soils, and slope stability maps, previous project reports and maps for the Los Vaqueros Watershed, and other publicly available databases such as the *East Contra Costa County Habitat Conservation Plan and Natural Communities Conservation Plan* (ECC HCPA, 2006) and previously recorded cultural resource sites from the Northwest Information Center. The analysis relied heavily on Geographic Information System analysis to determine the range and magnitude of potential effects, to quantify siting results, and to illustrate various facility configurations. Field work was conducted as necessary to complete the siting recommendations.

During the facility siting studies, the alternate sizes and locations were examined for the following facilities to determine the optimal facilities and locations for evaluation in the EIS/EIR:

- New Delta Intake and Pump Station
- Conveyance facilities
- Recreation facilities

In October 2004, analysts visited or viewed all the facility alternatives that were accessible within the Los Vaqueros Watershed or visible from public roads. Facility sites and pipeline alignments were further refined to avoid or minimize environmental impacts or to improve conditions for construction. To achieve a systematic approach to facility siting evaluation, siting criteria were developed for engineering, biological resources, cultural resources, and land use.

Once the preferred reservoir expansion size of 275 TAF was determined, facilities sizing and siting were refined to accommodate a smaller reservoir expansion project; however, much of the analysis conducted previously and summarized in the *Facilities Siting Report* (ESA, 2007) remained relevant and new recommendations to accommodate the smaller project were made. The recommendations were:

- New Delta Intake and Pump Station to be located along the western bank of Old River; approximately 1,000 feet south of the existing pump station or expansion of the existing Old River Intake and Pump Station and associated facilities could occur.

- Balancing reservoir to be located at the existing Transfer Facility (rather than a new, separate site within the watershed as previously proposed).

- Inlet-outlet pipeline to be located generally within the Kellogg Creek Valley; creek corridor including buffer zone to be avoided.

- Stockpile area to be located at the northern end of the Kellogg Creek valley, east of Walnut Boulevard in an upland field.

- Delta-Transfer and Transfer-LV Pipelines to be co-located within the existing easement for the Old River and Transfer pipelines, rather than a separate, new alignment.

- Transfer-Bethany Pipeline alignment to be located generally parallel to Vasco Road to the point where Armstrong Road turns south, following Armstrong Road to the terminus, heading southeast toward the Harvey O. Banks Pumping Plant and then westward to Bethany Reservoir; alignment adjusted to avoid wetlands and sensitive plant areas.

More reconnaissance surveys, required to include a full analysis of certain facilities where full access was not previously available, and to locate access roads, spoil disposal areas, pipeline staging areas, and power facilities, were conducted in 2007−2008. After a review of the surveys, it was determined that the proposed site of the new Delta Intake and Pump Station could be farther south to avoid potential maintenance issues associated with the accumulation of sediments in the channel at the original site. Additionally, two route alternatives for the last 1.5-mile segment of the Transfer-Bethany Pipeline were developed to avoid impacts to vernal pool fairy shrimp (*Branchinecta lynchi*) complexes and burrowing owl (*Athene cunicularia*). These two alternatives include a combination of tunnel and open trench construction.

After a review of the facilities siting analysis, the best apparent alternatives were identified to advance to the next step of analysis. The facility siting process supported a systematic approach to establishing a reduced set of feasible alternatives for detailed EIS/EIR analysis, which are designed to avoid and minimize adverse effects while contributing to project objectives.

Final Alternatives

Plan formulation efforts resulted in definition of the No Project/No Action Alternative and identification of the following four comprehensive alternative plans. These alternatives are described more fully in Chapter 3 of the Draft EIS/EIR.

No Project/No Action Alternative

Under the No Project/No Action Alternative, Reclamation and CCWD would take no action toward implementing a specific plan to develop additional water supplies for environmental water management programs or to help address water supply reliability and quality in the Bay Area.

Action Alternatives

Four action alternatives are summarized below and described in detail in Chapter 3 of the Draft EIS/EIR. **Table B-7** shows the key distinguishing characteristics of the final alternatives. Alternative 1 is considered the Proposed Project for purposes of CEQA and is treated as the Proposed Action for purposes of NEPA. Alternative 1 includes the largest reservoir expansion and greatest extent of associated facilities considered in the Draft EIS/EIR and is designed to meet both of the primary objectives. At the other end of the range, Alternative 4 represents the smallest reservoir expansion with the fewest new or expanded facilities.

- **Alternative 1**– Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management and Water Supply Reliability Dual Emphasis
- **Alternative 2** – Expanded 275-TAF Reservoir, South Bay Connection, Environmental Water Management Emphasis
- **Alternative 3** – Expanded 275-TAF Reservoir, No South Bay Connection, Environmental Water Management Emphasis
- **Alternative 4** – Expanded 160-TAF Reservoir, No South Bay Connection, Water Supply Reliability Emphasis

**TABLE B-7
ACTION ALTERNATIVES
WITH KEY DISTINGUISHING CHARACTERISTICS**

Project Characteristic	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Expanded Reservoir Capacity	275 TAF	275 TAF	275 TAF	160 TAF
Operational Emphasis	Environmental Water Management and Water Supply Reliability	Environmental Water Management	Environmental Water Management	Water Supply Reliability
New South Bay Connection?	Yes, 470 cfs	Yes, 470 cfs	No	No
Intake Facilities	Construct new 170-cfs intake facility on Old River	Construct new 170-cfs intake facility on Old River	Expand existing CCWD intake facilities by 70 cfs	No changes to existing intake facilities
Pipeline Capacity from Intake to Expanded Reservoir	Expand pipeline capacity by 420 cfs to 670 cfs	Expand pipeline capacity by 420 cfs to 670 cfs	Expand pipeline capacity by 320 cfs to 570 cfs	No changes to pipeline capacity

References – Appendix B

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APPENDIX C
Delta Water Resources - Modeling Analyses

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C-4 MODEL RESULTS – WATER SUPPLY AND MANAGEMENT

C-5 MODEL RESULTS - WATER QUALITY AND WATER LEVEL

C-6 STATISTICAL WATER QUALITY IMPACT ANALYSIS

C-7 FISHERY ANALYSIS

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Abbreviations and Acronyms

ACWD	Alameda County Water District
AFRP	Anadromous Fish Restoration Plan
AIP	Alternative Intake Project
ANN	artificial neural network
BA	Biological Assessment
Banks	Harvey O. Banks Pumping Plant
Bay Area	San Francisco Bay Area
BO	Biological Opinion
CACMP	Common Assumptions Common Model Package
CALFED	CALFED Bay-Delta Program
CCC PP No. 1	Contra Costa Canal Pumping Plant Number 1
CCWD	Contra Costa Water District
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DCC	Delta Cross Channel
Delta	Sacramento-San Joaquin Delta
DI	Demand Index
DICU	Delta Island Consumptive Use
DMC-CA	Delta-Mendota Canal - California Aqueduct
DSM2	Delta Simulation Model, Version 2
DWR	California Department of Water Resources
D-xxxx	State Water Resources Control Board Water Right Decision number
E/I	Export to Inflow ratio for Delta flows
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
ECCID	East Contra Costa Irrigation District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EWA	Environmental Water Account
FRWA	Freeport Regional Water Authority
GLC	Grant Line Canal
JPOD	Joint Point of Diversion
LV	Los Vaqueros
M&I	municipal and industrial
mg/L	milligrams per liter
mm	millimeter
msl	mean sea level
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOD	north-of-Delta
NRDC	National Resources Defense Council
OCAP	Operations Criteria and Plan

OMR	Old and Middle Rivers
PTM	particle tracking module
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
SBA	South Bay Aqueduct
SCVWD	Santa Clara Valley Water District
SDIP	South Delta Improvements Program
SOD	south-of-Delta
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAMP	Vernalis Adaptive Management Plan
WRESL	Water Resources Simulation Language
WRIMS	Water Resources Integrated Modeling System
WSI	Water Supply Index
yr	year
Zone 7	Alameda County Flood Control and Water Conservation District, Zone 7
°C	degrees Celsius
°F	degrees Fahrenheit

C-1 INTRODUCTION

This appendix presents the application and results of facility operations and hydrodynamic and water quality modeling in support of the Draft Los Vaqueros Reservoir Expansion Project Environmental Impact Statement/Environmental Impact Report (Draft EIS/EIR). The purpose of the analysis was to identify potential environmental impacts of the Los Vaqueros Reservoir Expansion Project (project) relative to baseline conditions. The analysis was undertaken using the California Department of Water Resources (DWR) and United States Department of the Interior, Bureau of Reclamation (Reclamation) joint planning model, CalSim II, and DWR's Sacramento-San Joaquin Delta (Delta) Simulation Model, Version 2 (DSM2).

Organization of Appendix

This appendix is organized into eight chapters:

Chapter C-1, Introduction,
includes background information and the organization of the appendix.

Chapter C-2, Model Description,
summarizes the models used and the modeling approach.

Chapter C-3, Modeling Assumptions,
documents the specifics of modeling implementation.

Chapter C-4, Model Results – Water Supply and Management,
summarizes system operations modeling results for the project alternatives.

Chapter C-5, Model Results – Delta Water Quality and Delta Water Level,
summarizes Delta water quality and water level modeling results for the project alternatives.

Chapter C-6, Statistical Water Quality Impact Analysis,
presents statistical tests used to evaluate potential water quality impacts.

Chapter C-7, Fishery Analyses,
provides detailed results and analysis of the methods used for evaluating both direct and indirect effects on the Delta fishery.

Chapter C-8, References,
lists the sources used in compiling this appendix.

C-2 MODEL DESCRIPTION

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Introduction

The purpose of the system operations modeling and Delta hydrodynamic, water quality and particle tracking modeling is to quantify environmental water management, water supply reliability, and water quality benefits and assess the potential environmental impacts of each project alternative. This chapter summarizes the models and modeling process applied to the project; additional details on modeling assumptions are also provided.

Evaluation of the project alternatives requires simulation of three key, interrelated systems: (1) the statewide operations of the CVP and California State Water Project (SWP), (2) Delta hydrodynamics and water quality, and (3) CCWD's local operations. Separate models are available, or have been developed as part of this project, for simulating each of these systems, and the information produced from each model can be integrated to assess the potential of each alternative to achieve project objectives, and the potential effects on CVP/SWP operations and the Delta and upstream environments. Tools used for the project include: (1) the Los Vaqueros operations model, (2) CalSim II, including the artificial neural network (ANN) module for the Delta, and (3) DSM2, including the "hydro", "qual", and particle tracking modules. The statewide and CCWD operations models were combined to run together in an integrated fashion, as described below. This integration was designed to improve sharing of information between the models and provide a more accurate representation of the interrelationship between statewide and CCWD operations.

Operations Models

The operations models used for the project are described below. Complete model output is available for review through CCWD by contacting Marguerite Naillon, Special Projects Manager, at mnaillon@ccwater.com or (925) 688-8018.

WRIMS

The Water Resources Integrated Modeling System (WRIMS) is a generalized water resources software program developed by DWR's Bay-Delta Office. WRIMS is entirely data driven and can be applied to most reservoir-river basin systems. WRIMS represents a given physical system (reservoirs, streams, canals, pumping plants, etc.) through a network of nodes and arcs. The model user describes system connectivity and various operational constraints using a modeling language known as Water Resources Simulation Language (WRESL). WRIMS simulates facility operations using optimization techniques to route water through the network based on mass balance accounting. A mixed integer programming solver determines an optimal set of decisions at each monthly time step for a set of user-defined priorities (weights) and system constraints. The model is described by DWR (2000a) and Draper et al. (2004).

CalSim II

As California's largest water projects, CVP and SWP operations influence and, at times, control flow in the Sacramento and San Joaquin river basins and the Delta. For this Draft EIS/EIR, water conditions and facility operations in the Delta and upstream areas are being simulated using the CalSim II model.

CalSim II is an application of the WRIMS software that was jointly developed by Reclamation and DWR for performing planning studies related to CVP and SWP operations. The primary purpose of CalSim II is to evaluate the water supply reliability of the CVP and SWP at current or future levels of development (e.g., 2005, 2030), with and without various assumed future facilities, and with different modes of facility operations. Geographically, the model covers the drainage basin of the Delta, and CVP/SWP exports to the San Francisco Bay Area (Bay Area), Central Coast, and Southern California. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over the period of simulation, representing a fixed level of development. The historical flow record of October 1921 to September 2003, adjusted for the influence of land use change and upstream flow regulation, is used to represent the possible range of water supply conditions. Major Central Valley rivers, reservoirs, and CVP/SWP facilities are represented by a network of arcs and nodes. CalSim II uses monthly mass balance accounting, and therefore cannot simulate the tidal hydrodynamics of the Delta, and has limited ability to represent Delta water quality.

There are many sources of information documenting the CalSim II model, including two peer reviews. Relevant reports include the following (Reclamation, 2008):

- External peer review commissioned by the CALFED Bay-Delta Program (CALFED) (Close et al., 2003)
- Analysis of an historical operations simulation (DWR, 2003)
- Analysis of the effect varying selected parameters has upon model results (sensitivity analysis study) (DWR, 2005)
- Analysis of the significance of the simulation time step to the estimated SWP delivery amounts (DWR, 2005).
- Peer review of San Joaquin River Valley application (Ford et al., 2006)

CalSim II can be used in either a comparative or an absolute mode. The comparative mode consists of comparing two model runs: one that contains a reservoir expansion project alternative and one that does not. Differences in certain factors, such as deliveries or reservoir storage levels, are analyzed to determine the effects of the project alternatives on system-wide operations. All of the assumptions are the same for the No Action/No Project and action alternative model runs, except the action itself, and the focus of the analysis is the differences in the results. In the absolute mode, results of a single model run, such as the amount of delivery or reservoir levels, are considered directly. Model assumptions and results are generally believed to be more reliable in a comparative study than an absolute study.

Results from a single simulation may not necessarily correspond to actual system operations for a specific month or year, but are representative of general water supply conditions. Model results are best interpreted using various statistical measures such as long-term or year-type averages.

Common Assumptions Common Model Package

In previous analyses, the CalSim II version that supported the 2004 Operations Criteria and Plan (2004 OCAP) and OCAP Biological Assessment (OCAP BA) had been used to analyze statewide operations (Reclamation, 2004a).[1] However, a revised and updated CalSim II model version has been developed for the DWR/Reclamation Surface Storage Investigations and has been adopted for the project Draft EIS/EIR analysis. This updated version of CalSim II is described in the following sections.

DWR, Reclamation and a team of consultants have developed a set of "common assumptions", together with a common set of tools and model studies, collectively known as the Common Assumptions Common Model Package (CACMP). The CACMP is intended to provide a common baseline for analyzing the surface storage projects currently under evaluation in California and to provide an evaluation framework that facilitates consistent analyses among the surface storage project teams. The CACMP shares many of the same operational rules and facilities as the 2004 OCAP BA modeling studies; however, the CACMP did make a number of changes corresponding to updated information, including, but not limited to: (1) SWP Banks Pumping Plant capacity is limited to 6,680 cfs in both the existing and future scenarios; (2) CCWD's Alternative Intake Project, the SBA Enlargement Project, and the Freeport Regional Water Project are incorporated into the future scenarios; (3) minimum flow requirements in the Lower Yuba River for both existing and future scenarios correspond to D-1644; and (4) the Delta-Mendota Canal-California Aqueduct (DMC-CA) Intertie with a limited CVP/SWP integration is included in the future scenario (CACMP, 2007a). For a full description of the assumptions incorporated into the CACMP modeling, consult the Common Assumptions team.

As part of the CACMP effort, the Los Vaqueros operations model (described later in this chapter) was integrated into the CACMP CalSim II model to allow dynamic calculation of operational parameters. The CACMP CalSim II model version used as the basis of the project modeling studies completed for the Draft EIS/EIR is Version 8D[2]. The CACMP includes a set of CalSim II studies. One of the studies simulates the existing condition as of 2005 and is the basis for the project Existing Condition. The CACMP Future No Action study is the basis of the Future No Action/No Project Alternative[3].

CalSim II Revisions and Updates

Revisions to CACMP CalSim II Version 8D were required for modeling for this Draft EIS/EIR to: (1) update the existing condition to account for new facilities, (2) include a limited Environmental Water Account (EWA) program, (3) include a representation of assumed future Delta operations in light of the December 2007 court interim remedial order in *NRDC vs. Kempthorne* and OCAP reconsultation, (4) adjust CVP/SWP annual allocation procedures, and (5) improve the efficiency of model simulation. These revisions are discussed in the following sections.

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1 These OCAP BA studies were released by Reclamation on February 2, 2004, with revisions released June 30, 2004. The studies and their outlined assumptions are available from Reclamation's Central Valley Operations Office Web site (Reclamation, 2004b).

2 CACMP CalSim II Version 8D contains studies for two levels of development. Studies for existing and future no action conditions were dated April 22, 2007.

3 The Sacramento Valley hydrology used in the Future No Action CalSim II model reflects 2020 land-use assumptions associated with Bulletin 160-98 (DWR, 1998). The San Joaquin Valley hydrology reflects draft 2030 land-use assumptions developed by Reclamation to support Reclamation studies.

Existing Conditions

The CACMP assumes an existing condition as of June 2004. The CACMP version of CalSim II has been updated to include: (1) the SBA Enlargement Project[4]; and (2) CCWD's Alternative Intake Project[5].

Limited EWA

The objective of simulating the EWA Program for project modeling is to represent the limited program as it has been implemented in 2008 and is expected to be implemented in coming years by SWP and CVP operations. This is referred to as Limited EWA (Reclamation, 2008). The EWA Program is not represented in the CACMP. Modeling for this Draft EIS/EIR assumes that EWA purchases are limited to 60,000 acre-feet, as provided for by the Lower Yuba River Accord (YCWA, 2007). Modeling also assumes that EWA actions are limited to the Vernalis Adaptive Management Plan (VAMP) export reduction at the Banks Pumping Plant.

Operational Modifications for new Operations Criteria and Plan (OCAP) Biological Opinions

The United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) have been required by federal court orders in *Natural Resources Defense Council v Kempthorne* (2007) and *Pacific Coast Federation of Fishermen's Associations v Gutierrez* (2008) to issue new biological opinions based on the 2008 OCAP for operating the SWP and CVP. USFWS issued its biological opinion on December 15, 2008. NMFS is currently preparing its biological opinion with a target for completion by mid summer 2009.

In the case of *Natural Resources Defense Council v Kempthorne*, the May 25, 2007 court order found the 2004 OCAP BO to be unlawful and inadequate and the accompanying Delta Smelt Risk Assessment Matrix, adopted to implement the 2004 OCAP BO, in violation of the Administrative Procedure Act. After a seven-day evidentiary hearing, held on August 21 through 24 and August 29 through 31, 2007, a list of interim remedies was developed. These remedies were included in an interim remedial order, dated December 14, 2007, which was intended to prevent the extinction of the delta smelt and the destruction or adverse modification of their habitat via a number of restrictions to CVP and SWP operations. This order continued in effect until completion of the reconsultation on the OCAP and issuance of the USFWS OCAP BO for delta smelt on December 15, 2008.

The analyses pertaining to operations of the SWP and CVP in this document are based on the Interim Order issued by Judge Wanger and the 2004 OCAP. The interim measures rely upon real-time conditions and cannot be simulated with one simple set of rules. Future measures are also likely to be based on real-time conditions. Modeling for this Draft EIS/EIR considered moderate and severe restrictions on Delta export operations to protect fisheries that capture the range of current and anticipated future operating rules, based on the terms of the interim remedial order.

4 The SBA conveys water from Bethany Reservoir to ACWD, SCVWD, and Zone 7. The SBA was originally designed for a capacity of 300 cubic feet per second (cfs). The purpose of the SBA Enlargement Project is to increase the capacity of the SBA to 430 cfs to meet Zone 7 Water Agency's future needs and provide operational flexibility to reduce SWP peak power consumption. This enlargement to 430 cfs total capacity is included in the existing conditions assumptions for these model studies.

5 CCWD's Alternative Intake Project (AIP) consists of a new 250 cfs screened intake in Victoria Canal, and associated pump station and pipeline to connect to CCWD's Old River facilities.

The assumptions used in modeling these operations for the Draft EIS/EIR are described in Appendix C-3, under “Fishery Restrictions Applied in CalSim II Model”.

Because NMFS has not yet issued its biological opinion, it is not yet possible to assess the changes to SWP and CVP operations that may occur due to the combined effects of the USFWS and NMFS biological opinions for the 2008 OCAP. Reclamation and DWR intend to complete an analysis of the effects that the new biological opinions will have on the operations of SWP and CVP. It is possible that the new opinions may result in moderate to severe fishery restrictions being imposed on Delta exports, depending on annual hydrologic conditions, above and beyond those caused by the Interim Order. The analysis of the effects of the new biological opinions on the operations of the SWP and CVP will be described in the Final Federal Feasibility Report and Final EIS/EIR for this project.

Water Supply Index-Delivery Index

CalSim II CVP/SWP delivery logic uses runoff forecast information and uncertainty and a standardized rule (Water Supply Index (WSI) versus Demand Index (DI) Curve) to estimate the total water available for delivery and carryover storage. The WSI is a conservative estimate of the water available to be shared between different uses, including deliveries, Delta requirements, and carryover storage. The WSI is the sum of the beginning-of-month storage in project reservoirs and forecast inflow. The WSI changes from month to month as storage levels change, forecasts become more certain and the accumulated inflows to the reservoirs increase. Once the WSI value is determined, CalSim II calculates a DI value from the WSI-DI curve. The DI is the sum of water available for deliveries and carryover storage. Generation of the WSI-DI curves has been automated in CalSim II to minimize CVP/SWP delivery shortages resulting from over-optimistic allocations.

The fishery restrictions assumed in CalSim II studies for project alternatives, discussed above, significantly alter CVP/SWP system operations. The WSI-DI curves were “retrained” to account for newly simulated constraints on reverse flows in the Old and Middle rivers prior to developing Los Vaqueros CalSim II simulations. After completion of the WSI-DI retraining, south-of-Delta (SOD) SWP and CVP Delta Index versus Export Index tables were adjusted manually to better address conveyance constraints through the Delta and at the export pumps.

Model Simulation Efficiency

The CACMP CalSim II model simulation is separated into five steps to correctly account for use of Central Valley Project Improvement Act (CVPIA) (b)(2) water, and available capacity for wheeling water at Banks and Jones pumping plants. These steps are known as D-1485, D-1641, B2, Conveyance, and Transfer. A 12-month period is simulated under each step before proceeding to the next step. The results from the final step are accepted as the end-of-year system state, and serve as the initial conditions for each of the steps in the following year’s analysis. The purpose of the first three steps is to define CVPIA (b)(2) actions, which are subsequently fully implemented in the Conveyance step[6]. The Conveyance step also includes “Stage 1” transfers. “Stage 2” transfers are included in the subsequent Transfer step.

Modeling for the project alternatives uses a “single-step” simulation developed from the April 22, 2007 five-step Joint Point of Diversion (JPOD) model using the Conveyance step. CVP

6 Simulated (b)(2) actions include additional releases from Whiskeytown, Shasta, and Folsom reservoirs to support AFRP target flows, and pumping curtailment at the Jones Pumping Plant.

operations to meet the CVPIA (b)(2) requirements are based on simulated b2 actions developed for the CACMP. The purpose of the D1641, D1485 and b2 steps in CalSim II is to determine which b2 actions are implemented in each water year. These steps are omitted in project simulations because the b2 actions defined for the CACMP are used.

Water transfers, with the exception of EWA north-of-Delta (NOD) purchases, are not simulated. The "Stage 1" transfers cycle was not included. Joint Point of Diversion is not simulated in single-step CalSim II studies performed for this project. Under Stage 1, as defined in D1641, CVP diversions at the Banks Pumping Plant are limited to that needed to deliver water to the Cross-Valley Canal. Under Stage 2, CVP is allowed to wheel additional water through Banks Pumping Plant subject to meeting certain requirements. Neither Stage 1 nor Stage 2 of JPOD is included in the modeling performed for this project.

Delta ANN Module

Salinity in the Delta cannot be modeled accurately by the simple mass balance routing and coarse time step used in CalSim II. Instead, CalSim II uses two algorithms to translate water quality standards into flow equivalents that are subsequently used to help define facility operations. The Kimmerer-Monismith equation relates Delta salinity (defined by the X2 location) to Delta outflow (Kimmerer and Monismith, 1992). Using Delta outflow captures the effects of seawater intrusion and provides a good estimate of the salinity variation in the western Delta. However, salinity in the interior Delta is also influenced by the relative magnitude of flows through the Delta channels and export pumping. Agricultural drainage and M&I wastewater discharges also can affect local salinity conditions. To capture these effects in the interior Delta, DWR developed an ANN algorithm[7] capable of mimicking DSM2.

Prior to the CACMP, the ANN algorithm used to mimic DSM2 was trained on four input parameters (Delta inflow from the Sacramento Valley, Delta inflow from the San Joaquin River, total Delta exports, and Delta Cross Channel gate operations) to estimate electrical conductivity (EC) at key locations in the Delta. Appendix D of the Benchmark Studies Assumptions (DWR and Reclamation, 2002) provides details of implementation of the ANN within CalSim II. ANN performance is discussed by DWR (1999, 2002). The ANN was further refined as part of the CACMP. The refined ANN is trained on six input parameters that additionally include Net Delta Consumptive Use and Tidal Energy (the difference between daily maximum and daily minimum hourly astronomical tide). Training the ANN on six parameters produces water quality results that mimic DSM2 more closely than the four-input ANN. The CACMP ANN refinements also allow simulation of flow-salinity relationships at six locations. The six locations are as follows: (1) Emmaton, (2) Jersey Point, (3) Contra Costa Canal Pumping Plant No. 1 (CCC PP No. 1), (4) Collinsville, (5) Chipps Island, and (6) Antioch. The Emmaton, Jersey Point, Collinsville, Chipps Island, and Antioch salinity standards are modeled directly at their respective locations in the Delta. However, the CCC PP No. 1 chloride standard is translated into an equivalent salinity standard for the Old River at Rock Slough because of DSM2 difficulties in accurately modeling water quality in Rock Slough.

7 An Artificial Neural Network (ANN) is a non-linear statistical data modeling tool that can be used to model complex relationships between inputs and outputs or to find patterns in data.

Los Vaqueros Model

Using the WRIMS software, a model representing CCWD's existing Los Vaqueros Project and expansion project facility configurations was created, and then integrated with CalSim II. The Los Vaqueros Model represents the Los Vaqueros Reservoir, CCWD's Delta intakes at Rock Slough, Old River, and Victoria Canal, CCWD's intertie with the EBMUD Mokelumne Aqueduct, and new facilities as appropriate for the project alternatives (described in Chapter 3).

The Los Vaqueros Model was initially developed as a "stand-alone" model that requires input from other models to define boundary conditions. Inputs required for simulation include:

- Delta conditions (balanced vs. excess water conditions)
- Delta surplus available for diversion
- X2 location[8]
- Chloride concentration at Rock Slough, Old River, and AIP intakes

Delta Hydrodynamic and Water Quality Modeling – DSM2

DSM2 is a branched, one-dimensional model for simulating hydrodynamics, water quality, and particle tracking in a network of riverine or estuarine channels (DWR, 2000b). The model is used by DWR and others to perform operational and planning studies of the Delta. Details of the model, including source codes, model calibration, and model performance, are available from the DWR Bay-Delta Office, Modeling Support Branch web site (DWR, 2000b). Documentation of model development is discussed in annual reports to the SWRCB. A DSM2 schematic is shown in **Figure C2-1**.

The Hydro module of DSM2, applied to the Delta, simulates tidal hydrodynamics (channel stage, flow, and water velocity) using a 15-minute time step. For the project, DSM2 Hydro is used to evaluate changes in stage and flow in the south and central Delta.

The Qual module of DSM2 can simulate the movement of both conservative and non-conservative constituents. For the project, DSM2-Qual is used to assess changes in EC as a surrogate for salinity at key locations within the Delta. Additionally, a fingerprinting analysis is used to identify sources of EC and provide the basis for the EC-to-chloride conversion at CCWD's intakes.

The particle tracking module (PTM) simulates the movement of neutrally buoyant particles by advection and dispersion, using a random walk methodology. DSM2-PTM is a quasi three-dimensional extension of DSM2. Using the mean velocity from DSM2-Hydro, DSM2-PTM

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8 X2 is the distance in kilometers from the Golden Gate Bridge to the point where daily average salinity is 2 parts per thousand (ppt) at one meter above the bottom of the Sacramento River channel. The location of X2 is used as a surrogate measure of ecosystem health in the Delta. Under the State Water Resources Control Board (SWRCB)Water Right Decision 1641 (D-1641), CVP/SWP operators are responsible for maintaining the X2 location, as specified in the 1995 Water Quality Control Plan.

applies a logarithmic vertical velocity profile and a parabolic lateral velocity profile to allow longitudinal dispersion. For the project, DSM2-PTM is used to model the transport and fate of passive or non-mobile organisms within the Delta to help quantify circulation changes and resulting entrainment risks.

Tidal forcing is imposed at the downstream boundary at Martinez as a time series of stage (for the hydrodynamic module) and salinity (for the water quality module). DWR has traditionally used a “19-year mean tide” (or “repeating tide”) in 73-year (1922 through 1994) DSM2 planning studies, in which the tide is represented by a single repeating 25-hour cycle. An “adjusted astronomical tide” was later developed by DWR for a 16-year period (1976 to 1991) that accounts for the spring-neap variation of the lunar tide cycle (DWR, 2001a). As part of the Common Assumptions effort, an updated version of DSM2 has been developed that has extended the simulation period to 82 years (1922 through 2003) and uses an adjusted astronomical tide for the entire period of record. CACMP DSM2 Version 9 is used to provide water quality data at CCWD’s three Delta diversion locations (Rock Slough, Old River, Victoria Canal)[9] to simulate Los Vaqueros operations within CalSim II, and to evaluate Delta water quality impacts as a result of the project.

In this Draft EIR/EIS, two different levels of development are considered, 2005 for existing conditions and 2030 for future conditions. The differences between these levels of development in the DSM2 model are the amount of agricultural diversions and agricultural return flows, and the operations of South Delta barriers. The agricultural diversions and return flows (to approximately 250 diversion nodes and 200 drainage nodes) were calculated by the Delta Island Consumptive Use model with consideration of precipitation, seepage, evapotranspiration, irrigation, soil moisture, leach water, runoff, crop type, and acreage. The DSM2 model for existing conditions includes the South Delta Temporary Barriers Project (DWR, 2008b), which consists of four rock barriers that are installed seasonally across south Delta channels (at the head of Old River, Middle River, Old River near Tracy, and Grant Line Canal) as fish and agricultural barriers.

DSM2 modeling of future conditions includes the four proposed South Delta Improvement Program (SDIP) permanent operable barriers (at the head of the Old River, Grant Line Canal, Old River at Tracy Road Bridge, and Middle River at Old River) replacing the existing temporary barriers in order to minimize the number of in- and out-migrating salmon moving toward export pumps; to maintain adequate water levels for south Delta farmers to prevent cavitation from occurring in their irrigation pumps; and to improve water quality in south Delta channels by providing better circulation (DWR, 2008c). SDIP proposed three sets of operations for the gates: Plans A, B, and C. Plan C permanent barrier operations were assumed in DSM2 for future conditions.

Key DSM2 inputs include tidal stage, boundary inflow and salinity concentration, and operation of flow control structures. **Table C2-1** summarizes basic input requirements and assumptions for the CACMP DSM2 version. Results from CalSim II are used to define Delta boundary inflows, including the Sacramento River flow at Hood, San Joaquin River flow at Vernalis, inflow from

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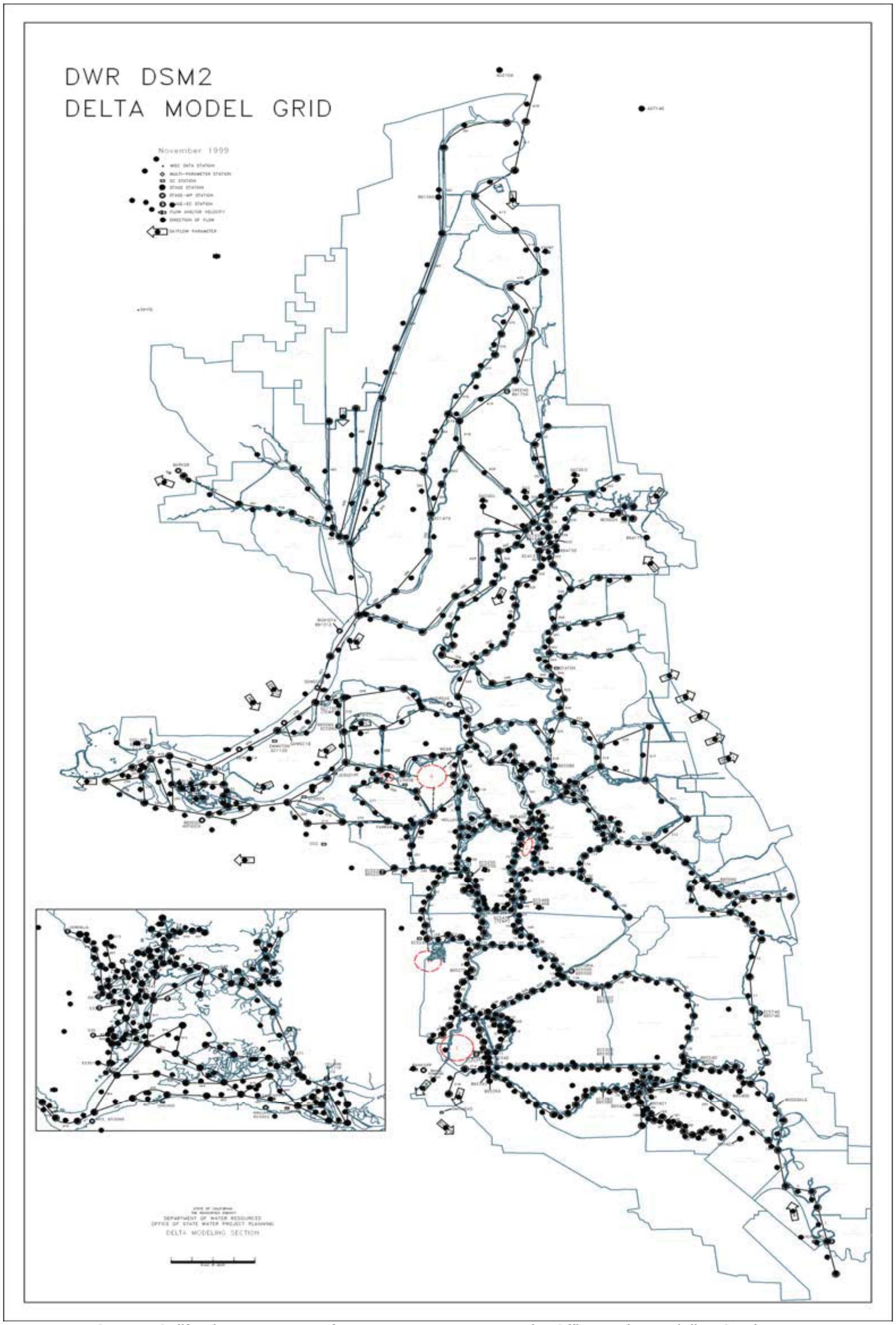
9 The Los Vaqueros module within CalSim II relies on input chloride concentrations to determine CCWD operations. The DSM2 channel locations used for this purpose are as follows:
(1) Rock Slough - ROLD024 (Old River at Bacon Island near Contra Costa Canal) was used for future LOD and CHCCC006 (Contra Costa Pumping Plant No.1) was used for the existing LOD. This distinction is made to include the effects of the CCWD Canal Replacement Project in the future LOD conditions.
(2) Old River - ROLD034, Old River near Byron.
(3) Victoria Canal (AIP) - CHVCT000, Victoria Canal at AIP.

the Yolo Bypass, and inflow from the east-side streams. In addition, net Delta outflow from CalSim II is used to calculate the DSM2 salinity boundary at Martinez.



Source: California Department of Water Resources, Bay-Delta Office, Delta Modeling Section, http://modeling.water.ca.gov/delta/models/dsm2/documentation.shtml.

Figure C2-1: Illustration of DSM2 Schematic

TABLE C2-1:
CACMP DSM2 INPUT REQUIREMENTS AND ASSUMPTIONS

Parameters	Assumptions
Period of Simulation	October 1976 – September 1991
Boundary Flows	CalSim II output: Sacramento River flow at Hood San Joaquin River flow at Vernalis Inflow from the Yolo Bypass Inflow from the east-side streams Net Delta Outflow CCWD diversions
Boundary Stage	15-minute adjusted astronomical tide
Agricultural Diversion & Return Flows	Delta Island Consumptive Use model, 2005/2030 level of development
Salinity	
Martinez EC	Computed from modified G-model, adjusted astronomical tide and Net Delta Outflow from CalSim II
Sacramento River	Constant value = 175 μS/cm
Yolo Bypass	Constant value = 175 μS/cm
Mokelumne River	Constant value = 150 μS/cm
Cosumnes River	Constant value = 150 μS/cm
Calaveras River	Constant value = 150 μS/cm
San Joaquin River	CalSim II EC estimate using link-node salt balance model
Agricultural Drainage	Varying monthly values that are constant year to year
Facility Operations	
Delta Cross Channel	CalSim II output
South Delta Barriers	Temporary barriers/SDIP operation of permanent barriers

Modeling Process

Modeling for the project alternatives included: (1) establishing baseline Delta water quality conditions; (2) developing operating rules for the project alternatives to optimize project benefits while minimizing potential environmental impacts, and (3) conducting impact analyses of the project alternatives. These modeling steps are summarized below.

Baseline Conditions

A set of baseline Delta water quality conditions was established using an iterative modeling procedure, as illustrated in **Figure C2-2**. These baseline conditions are inputs to CalSim II, and determine Los Vaqueros Reservoir blending operations. Two pairs of baseline conditions were developed, corresponding to scenarios with moderate and severe fishery restrictions on export pumping (described in Chapter 4.3) for both existing and future levels of development. These four distinct baseline conditions were developed using the following steps:

1. Retrain CalSim II WSI-DI (Water Supply Index versus Delivery Index) curves, and update Delta Index-Export Index tables for south-of-Delta CVP and SWP exports to account for imposed constraints on Delta exports (moderate or severe fishery restriction scenarios). Initial Delta water quality conditions were taken from DSM2

studies developed as part of the CACMP[10]. Initial Delta conditions were taken from CACMP CalSim II[11].

2. Simulate monthly operations for an 82-year period using the modified CACMP CalSim II version with integrated Los Vaqueros Model.
3. Simulate Delta tidal flows and EC using CACMP DSM2 for the 82-year period DSM2 run based on monthly CCWD/Los Vaqueros diversions and boundary flows from CalSim II (output from Step 2) as input.
4. Repeat steps 2 and 3 until changes in Los Vaqueros Project diversions and deliveries between iterations are small.

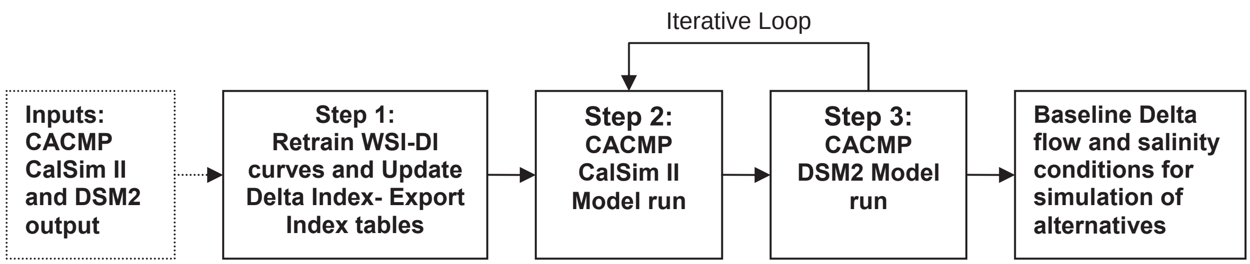


Figure C2-2: Development of Baseline Conditions

Minimizing Potential Delta Water Quality Impacts

Once baseline inputs were defined, operating rules were developed to avoid significant water quality impacts to other beneficial uses of Delta water. These operating rules were developed using the following steps as illustrated in **Figure C2-3**.

1. The system-wide baseline conditions defined through the iterative process shown in Figure C2-2 were used to simulate Los Vaqueros system operations for the Future No Action/No Project Alternative and a single project alternative.
2. The DSM2 model was used to estimate Delta water quality at important Delta locations for the Future No Action/No Project Alternative and project alternatives using Delta boundary flow inputs provided by CalSim II (Figure C2-2).
3. Water quality impacts were calculated by comparing Future No Action/No Project Alternative and the project alternative salinity (EC) output from Step 2.

[10] CACMP DSM2 V9 was used for both the existing and future levels of development. Chloride concentrations at CCWD diversion locations and in the South Delta were converted from DSM2 EC data based on the flow fraction of Martinez water present at each location, which were computed from a DSM2 fingerprinting study. The chloride conversion relationship assumes that if the fraction by volume of water from the Martinez boundary was less than 0.4% then, for that time step, Cl (mg/L) = 0.15*EC (μS/cm) – 12; otherwise Cl (mg/L) = 0.285*EC (μS/cm) – 50.

[11] CalSim II requires an initial estimate of CCWD diversions, which are subsequently refined during model simulation. The initial set of CCWD diversions were defined using the stand-alone Los Vaqueros Model. Inputs to the stand-alone Los Vaqueros Model include Delta conditions taken from April 22, 2007 five-step JPOD CalSim II model, CONV step output, and Delta water quality taken from CACMP DSM2 V9.

4. Operating rules were developed in the Los Vaqueros Model for the project alternative to minimize water quality impacts caused by the project alternative.
5. Steps 1 through 4 were repeated until all impacts calculated in Step 3 were found to be less than significant. Once this was completed, the final set of operating rules was incorporated in the CACMP CalSim II Los Vaqueros integrated model.

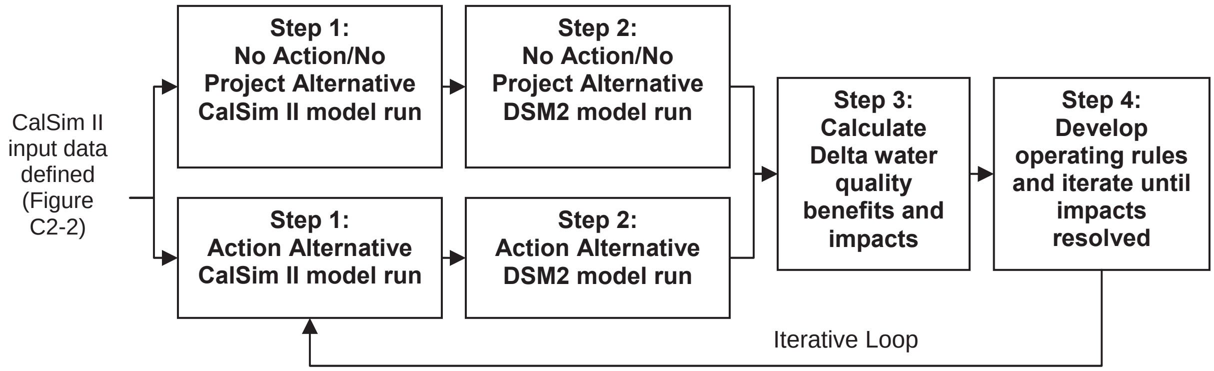


Figure C2-3: Development of Water Quality Rules

C-3 MODELING ASSUMPTIONS

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Introduction

This chapter discusses the modeling assumptions used to characterize the Existing Conditions, the Future No Action/No Project Alternative, and the project alternatives described previously in Chapter 3. The different assumptions for the 2005 (existing) and 2030 (future) levels of development are summarized in **Table C3-1**. Table 3-3 in Chapter 3 summarizes the major facility components of the project alternatives.

TABLE C3-1:
OPERATIONS MODEL ASSUMPTIONS FOR EXISTING AND FUTURE LEVELS OF DEVELOPMENT

Description	Units	Existing Level of Development	Future Level of Development
PROJECTS OR FACILITIES			
Rock Slough Intake and Contra Costa Canal Pumping Plant No.1	(cfs)	350	350
Rock Slough Canal Replacement Project		NA[1]	Included
CCWD/EBMUD Intertie			
Annual delivery[2]	(TAF)	NA	3.2
Intertie capacity	(cfs)	NA	155
South Bay Aqueduct Improvement and Enlargement[3] Brushy Creek Pipeline capacity	(cfs)	430	430
Freeport Regional Water Project[4,5]		NA	Included
DMC-CA Intertie		NA	Included
South Delta Improvements Program, Phase 1 (barriers)		NA	Included
South Delta Improvements Program, Phase 2		NA	Not Included
WATER DEMANDS			
CCWD demand[6 7]	(TAF/yr)		
Wet year		111	149
Above normal year		118	157
Below normal year		124	162
Dry year		135	175
Critical year		144	184
EBMUD - CCWD Settlement Agreement			
Delivery amount[8]	(TAF/yr)	NA	3.2
Delivery location		NA	Preferential delivery to storage, also direct delivery
Period of diversion		NA	December

[1] NA = not applicable.
[2] Under the CCWD settlement agreement, FRWA and EBMUD will wheel CVP contract water for CCWD.
[3] Due to the current construction schedule of the SBA Improvement and Enlargement Project, the expanded SBA capacity of 430 cfs is included in the existing condition scenarios.
[4] Included in 2004 OCAP as part of the formal consultation.
[5] The Freeport Regional Water Project is a joint venture of the Sacramento County Water Agency and East Bay Municipal Utility District to supply water from the Sacramento River to customers in Sacramento County and the East Bay. Final EIR has been certified, Final EIS has been released, and on January 4, 2005, Reclamation issued the Record of Decision.
[6] Derived from CCWD's Future Water Supply Study (CCWD, August 1996), with adjustments made for the future condition to estimate the demand distribution in 2030. Future condition demands represent Service Area C. Demands and demand pattern taken from April 2004 Planning Report.
[7] Water-years defined by Sacramento Valley Index.
[8] Included in CCWD's 195 TAF/year CVP contract

TABLE C3-1:
OPERATIONS MODEL ASSUMPTIONS FOR EXISTING AND FUTURE LEVELS OF DEVELOPMENT

Description	Units	Existing Level of Development	Future Level of Development
WATER QUALITY INPUT DATA – chloride concentration			
Rock Slough at CCWD Pumping Plant No. 1	(mg/L)	DSM2 output (CHCCC006)	DSM2 output (ROLD024)
Old River at Old River Pumping Plant	(mg/L)	DSM2 output (ROLD034)	DSM2 output (ROLD034)
New Delta Intake	(mg/L)	DSM2 output (ROLD034)	DSM2 output (ROLD034)
Victoria Canal at AIP	(mg/L)	DSM2 output (229_3048)	DSM2 output (229_3048)
Kellogg Creek	(mg/L)	Varies, 11 - 300	Varies, 11 - 300
Precipitation inflow to Los Vaqueros	(mg/L)	7	7
Mokelumne Aqueduct	(mg/L)	NA	7.5

Fishery Restrictions Applied in CalSim II Model

Biological opinions (BOs) from the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) impose restrictions on CVP and SWP operations for the protection of federally listed threatened and endangered species and their critical habitat. On May 16, 2008, Reclamation requested the initiation of formal consultation under Section 7 of ESA for the continued long-term operation of the CVP and SWP.

In *NRDC v. Kempthorne*, Federal District Judge Oliver Wanger ordered USFWS to issue a new BO for the protection of Delta smelt. Until the new BO was issued, project operations adhered to the interim remedies order issued by Judge Wanger on December 14, 2007. The order provides for a range of restrictions based on real-time conditions that cannot be simulated with one simple set of rules. Therefore, a range of operating restrictions of the interim remedies order are used to encompass the range of existing and future operational restrictions in the project modeling studies. Future restrictions will be examined to determine if the analyses results change. If those analyses indicate a new or substantially more severe impact would occur, then supplemental environmental review under CEQA and NEPA would be required prior to taking further actions.

Modeling for the project alternatives includes constraints on export diversions at the SWP Banks and CVP Jones (formerly Tracy) pumping facilities to meet reverse flow requirements in the Old and Middle rivers that are similar to those specified in the interim remedies order, which are designed to be protective of delta smelt. In addition, to be protective of longfin smelt, the starting date of the period during which the constraints can be triggered has been set to December 1, which is earlier than the date specified in the interim order (December 25).

Table C3-2 outlines the *NRDC vs. Kempthorne* interim remedies order and the actions required to protect delta smelt and their habitat.

TABLE C3-2:
NRDC VS. KEMPTHORNE INTERIM REMEDIES ORDER ACTIONS

Timing of Action	Delta Smelt Life Stage Protected by Action	OMR Flow Requirements	Trigger for Start of Action	End of Action	Reference in Interim Order
10 days in late-Dec to early Jan	Adult	-2,000	Turbidity, unless Sacramento inflow > 80,000 cfs (3-day average)	10 days after initiation of action or January 15 (whichever is first); can be ended early if: (a) Sacramento inflow > 80,000 cfs (3-day average), or (b) onset of spawning (identified by any of the indicators listed below)	p. 5-6
Jan to start of spawning	Adult	-5,000	Immediately following pulse flow (first action) or January 15 (whichever is earlier), but not start until Sacramento inflow < 80,000 cfs	**Onset of spawning as indicated by:** (1) the presence of spent female delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; (2) when larval delta smelt are detected in the 20-mm survey or at either export pumping plant's salvage facility; or (3) when water temperature in the Delta reaches 12°C (53.6°F) determined by the average of the daily water temperatures at the Mossdale (MSD), Antioch (ANH or ANC) and Rio Vista (RIV or RVB) monitoring stations.	p. 6-7
Start of spawning to June 20	Adult / larval / juvenile	-750 to -5,000	Onset of spawning (identified by any of the indicators listed above)	Whichever occurs first: June 20 or when risk of entrainment is abated (to be determined by USFWS, Reclamation, and DWR, no metrics given)	p. 7-8

As shown in Table C3-2, the timing of the OMR flow requirements, as well as the level of required OMR flow, vary depending on Delta conditions. This creates uncertainty regarding implementation of the required actions detailed in the interim remedies order. To capture the range of potential requirements, and to capture the range of operational constraints that will be included in new BOs, two scenarios were simulated. The "moderate fishery restriction" scenario represents a less restrictive set of actions, while the "severe fishery restriction" scenario captures more restrictive actions that may be required under the interim remedies order (**Table C3-3**).

TABLE C3-3:
MODEL ASSUMPTIONS FOR COMBINED OMR FLOW CONSTRAINTS

Month	Trigger	Condition	Minimum OMR Flow	
			Moderate fishery restriction	***Severe fishery restriction***
October - November	N A	N A	No Action	
December	Turbidity	Sacramento Inflow - Sacramento Inflow (previous month) <= 6,000 cfs OR Sacramento plus Yolo Inflow > 80,000 cfs	No Action	
		6,000 cfs < Sacramento Inflow - Sacramento Inflow (previous month) <= 10,000 cfs	Dec. 1-15: No Action Dec. 16-25: -2,000 cfs Dec. 26-31: -5,000 cfs	
		Sacramento Inflow - Sacramento Inflow (previous month) > 10,000 cfs	Dec. 1-10: -2,000 cfs Dec. 11-31: -5,000 cfs	
January	Turbidity	Action taken in December	-5000 cfs	
		Sacramento plus Yolo Inflow <= 50,000 cfs AND Sacramento Inflow - Sacramento Inflow (previous month) <= 6,000 cfs	Jan. 1-14: No Action Jan. 15-31: -5,000 cfs	
		Sacramento plus Yolo Inflow <= 50,000 cfs AND 6,000 cfs < Sacramento Inflow - Sacramento Inflow (previous month) <= 10,000 cfs	Jan. 1-9: No Action Jan. 10-14: -2,000 cfs Jan. 15-31: -5,000 cfs	
		Sacramento plus Yolo Inflow <= 50,000 cfs AND Sacramento Inflow - Sacramento Inflow (previous month) > 10,000 cfs	Jan. 1-10: -2,000 cfs Jan. 11-31: -5,000 cfs	
		50,000 cfs < Sacramento plus Yolo Inflow <= 80,000 cfs	Jan. 1-10: -2,000 cfs Jan. 11-31: -5,000 cfs	
		Sacramento plus Yolo Inflow > 80,000 cfs	No Action	
February	Spawning (12 deg. C)	Sacramento plus Yolo Inflow > 30,000 cfs	Feb. 1-15: -5,000 cfs Feb. 16-28: -4,500 cfs	Feb. 1-15: -5,000 cfs Feb. 16-28: -2,500 cfs
		Sacramento plus Yolo Inflow <= 30,000 cfs	Feb. 1-15: -5,000 cfs Feb. 16-28: -3,500 cfs	Feb. 1-15: -5,000 cfs Feb. 16-28: -1,500 cfs
March	Proximity of smelt to export pumps	Sacramento plus Yolo Inflow > 30,000 cfs	-4,500 cfs	-2,500 cfs
		Sacramento plus Yolo Inflow <= 30,000 cfs	-3,500 cfs	-1,500 cfs
April	Proximity of smelt to export pumps	Sacramento plus Yolo Inflow > 30,000 cfs	-4,500 cfs	-2,500 cfs
		Sacramento plus Yolo Inflow <= 30,000 cfs	-3,500 cfs	-1,500 cfs
May	Proximity of smelt to export pumps	Sacramento plus Yolo Inflow > 30,000 cfs	-4,500 cfs	-2,500 cfs
		Sacramento plus Yolo Inflow <= 30,000 cfs	-3,500 cfs	-1,500 cfs
June	Proximity of smelt to export pumps	Sacramento plus Yolo Inflow > 30,000 cfs	-4,500 cfs	-2,500 cfs
		Sacramento plus Yolo Inflow <= 30,000 cfs	-3,500 cfs	-1,500 cfs
July - September	N A	N A	No Action	

Common Assumptions has not yet developed a standard constraint equation for OMR flows under either the Wanger Ruling or the 2008 OCAP. Currently, more than one equation is being evaluated by the Common Assumptions effort. For this Draft EIS/EIR, the average of three previously developed relationships for OMR net flow was used. To meet the OMR flow restrictions, export diversions at the Banks and Jones pumping facilities are varied based on a linear relationship between OMR flows and export pumping and San Joaquin River inflow to the Delta of the form $Q_{OMR} = A*Q_{San\ Joaquin\ River} + B*Q_{Exports} + C$. The coefficients of these relationships are presented in **Table C3-4**.

In Alternatives 1 and 2, the term used for export diversions ($Q_{Exports}$) includes the portion of the pumping at Los Vaqueros intakes for South Bay water agencies that is shifted from the Banks and Jones facilities. The relationship used to represent OMR net flow in these alternatives is $Q_{OMR} = A*Q_{San\ Joaquin\ River} + B*Q_{(Banks+Jones+Improved\ Fish\ Screening)} + C$, where “Improved Fish Screening” is the pumping shifted from the Banks and Jones facilities to Los Vaqueros Reservoir intakes.

In without project conditions, and in Alternatives 3 and 4, the exports term is represented by pumping at the Banks and Jones facilities such that $Q_{OMR} = A*Q_{San\ Joaquin\ River} + B*Q_{(Banks+Jones)} + C$.

TABLE C3-4:
OMR NET FLOW RELATIONSHIPS

OMR Relationship	A	B	C
DWR	0.58	-0.913	0
USGS 1	0.4486	-0.7695	-590
USGS 2	0.7094	-0.7094	-4619

Factors such as tides and wind that may have a smaller, short-term effect on OMR flows are not included in the calculation. It is assumed that the fishery restrictions are shared equally between Banks and Jones.

The interim remedies order calls for adaptive management of operations based on real-time monitoring of conditions in the Delta, including the turbidity and temperature of Delta waters, the location of delta smelt populations, and the seasonal onset of delta smelt spawning. These parameters are not directly available from the CalSim II and DSM2 model tools used in this analysis. Therefore, Delta flow conditions that are available as CalSim II model outputs were used as surrogates for estimation of these parameters, as described below.

Bracketing

Flow-based or calendar-based triggers for protective actions can be implemented in CalSim II, while triggers based on water turbidity, water temperature, or fish survey results, cannot be directly implemented, because these parameters are not used in the CalSim II model. Modeling adaptive management actions is, by the nature of the actions, approximate. To capture the range of potential actions and resulting Delta water project operations under the interim remedies order, and also attempt to anticipate the USFWS and NMFS OCAP BO documents, two operations scenarios based on the interim remedies order were simulated. The “moderate fishery restriction” scenario represents the least restrictive set of actions that are reasonably expected to occur, while the "severe fishery restriction" scenario captures more restrictive requirements that are reasonably expected to occur. The modeling analysis for the project was performed using both the moderate and severe fishery restrictions assumptions to bracket the range of benefits and resulting environmental effects of the project alternatives.

Turbidity

An increase in turbidity in Delta waters is used in the interim remedial order to indicate the movement of delta smelt into their Delta spawning grounds. Limited turbidity data are available from Delta channels; therefore, available data from Freeport on the Sacramento River were used to identify a relationship between changes in Sacramento River flow and increases in turbidity in Sacramento River water at Freeport. A similar set of turbidity data were available for the San Joaquin River at Vernalis, but no clear relationship between flow and turbidity was apparent, possibly because of differences in runoff patterns in response to precipitation events on the two rivers. The pattern identified for the Sacramento River at Freeport, illustrated in **Figure C3-1**, was assumed to be valid for Delta channels also, and was incorporated as shown in Table C3-3.

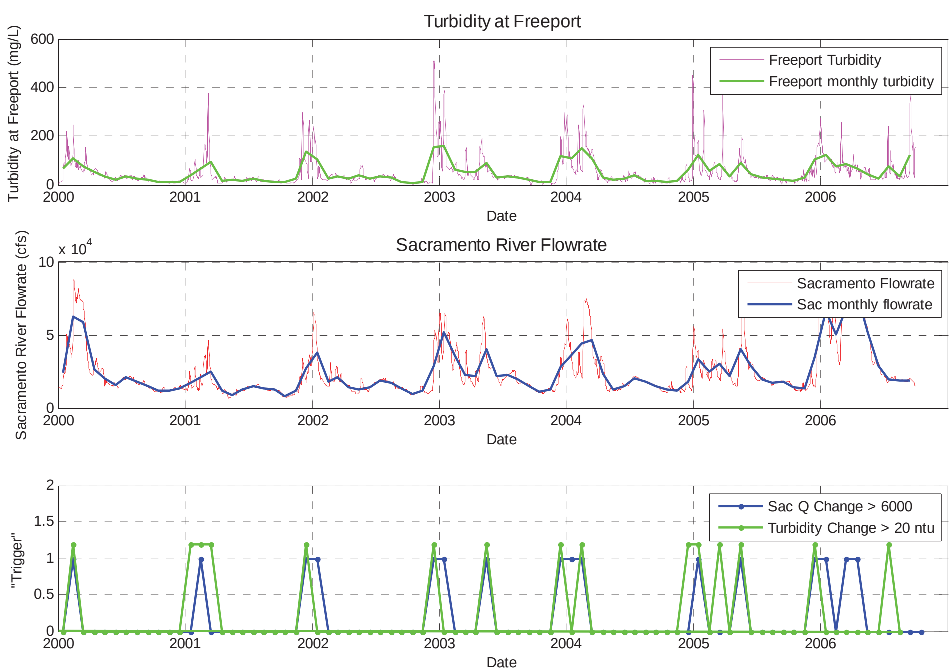

Figure C3-1: Application of Available Turbidity Data

The data for daily turbidity at Freeport and for Sacramento River daily flowrate were averaged to obtain monthly turbidity and monthly flowrate values. These are shown in Figure C3-1a and Figure C3-1b. It was observed that increases in monthly average flowrate at Freeport of greater than 6,000 cfs are correlated with increases in turbidity of greater than 20 ntu at Freeport. In Figure C3-1c, this relationship is presented graphically to demonstrate the co-occurrence of the increases in flow and turbidity. To make the relationship easier to see, the changes in flow and turbidity are represented either as a positive "trigger" value when the change is larger than 6,000 cfs or 20 ntu, respectively, or are assigned a value of zero when the change in monthly average flow or turbidity is not larger than these values. As shown, a spike in the flowrate of 6,000 cfs in Sacramento River over one or two months serves as a good proxy for turbidity increases in the Sacramento River.

Note that the interim remedial order on delta smelt calls for the initial pulse flow action to begin on or after December 25 in response to increased Delta turbidity, but the project modeling assumes the action could begin as early as December 1, as a conservative estimate that can also account for a potential future action to protect longfin smelt.

Temperature

The interim remedial order requires that adaptive management of the OMR flows be initiated in response to the onset of delta smelt spawning. According to the order, the onset of spawning is to be determined by one of three methods: collection of spent (post-spawning) adult smelt, collection of larval smelt, or an increase above 12 deg. C in Delta waters. Because neither temperature data nor fish monitoring results are incorporated in the CalSim II model, temperature data from an external source was used in the project studies to identify the assumed onset of spawning. Temperature data for Delta waters from the Interagency Ecological Program database (http://www.iep.ca.gov/dss/) were applied for this purpose. A relationship between these temperature data and available flow values was not apparent. Therefore, February 15, which is the average date of the temperature increase above 12 deg. C in Delta waters (as measured by the average of three monitoring stations located at Antioch, Rio Vista and Mossdale) was used in all years in the model studies performed for the EIS/EIR to indicate the onset of delta smelt spawning.

Adaptive Management

Once delta smelt spawning has begun, the interim remedial order requires that OMR flows be regulated to minimize smelt mortality at the Banks and Jones facilities. Likelihood of mortality is to be determined by evaluating the location of smelt populations from fisheries surveys, in conjunction with salvage monitoring at the export facilities. Because this type of information is not available in CalSim II, a relationship to flow was again used as a rough estimator of smelt population location. Analysis of available sampling information indicates that under relatively higher Delta outflow conditions, the delta smelt population tends to be near the confluence and in Suisun Bay (Bennett, 2005). Conversely, under relatively lower outflow conditions, the delta smelt population tends to be farther into the south Delta. These general relationships are reflected in the parameters chosen for required OMR flow values under the adaptive management period that begins with the onset of spawning, as shown in Table C3-3.

Water Demand Assumptions

CCWD Demand

CCWD demands are summarized by water-year type in Table C3-1. CCWD has a delivered water quality goal of delivering water with less than or equal to 65 mg/L chloride concentration. The model delivers the best possible water quality to CCWD customers while optimizing reservoir storage.

Delta Supply Restoration Demand

The South Bay water agencies' demand for Delta Supply Restoration water from an expanded Los Vaqueros Reservoir system was estimated using CalSim II data for each of the three SBA water agencies (ACWD, SCVWD, and Zone 7) and the SCVWD CVP M&I water users, collectively referred to as the South Bay water agencies. Delta supply restoration deliveries to the South Bay water agencies in Alternative 1 were assumed to replace deliveries lost due to the implementation of the *NRDC vs. Kempthorne* decision. The Delta Supply Restoration demands were estimated by taking the difference in deliveries for each participating agency as output from CalSim II simulations for both pre- and post-delta smelt protection actions. Dry and critical year demands were then increased by an additional 50 percent and 200 percent, respectively, to approximate the estimated level of water supply required by these agencies in all years (contract allocation values are lower in dry and critically dry years, requiring more reliability water to meet a minimum delivery requirement). These values may be refined in future studies if improved estimates of the reliability demands of these agencies are developed. **Table C3-5** summarizes by water-year type the assumed Bay Area reliability demand from an expanded Los Vaqueros Reservoir.

TABLE C3-5:
DELTA SUPPLY RESTORATION DEMANDS BY WATER-YEAR TYPE

	Total Demand (TAF/year)[2]			
	Existing		Future	
Water-Year Type[1]	Severe fishery restriction	Moderate fishery restriction	Severe fishery restriction	Moderate fishery restriction
Wet	54.4	36.5	67.5	45.9
Above Normal	76.6	50.6	94.2	63.0
Below Normal	72.6	53.2	92.0	62.1
Dry	92.3	69.5	100.0	66.5
Critical	114.1	82.3	100.7	71.4

Notes:
[1] Water-years defined by Sacramento Valley Index (Oct – Nov).
[2] TAF/year = thousand acre-feet per year

Environmental Water Demand

Environmental water demands met by Alternatives 2 and 3 are represented in the model by Incremental Level 4 and replacement demands, as established by water service contracts in the San Joaquin Valley and Tulare Basin. The annual refuge demands have been scaled up to account for an assumed average 11.3 percent conveyance loss. **Table C3-6** summarizes monthly refuge demands to be met through deliveries from the project facilities for Alternatives 2 and 3.

In Alternative 2, environmental water is delivered through the South Bay Connection to Bethany Reservoir, and from there to San Luis Reservoir. In Alternative 3, there is no direct connection from the project facilities to Bethany Reservoir to deliver refuge supplies. Instead, CCWD foregoes its CVP contract diversions during Delta balanced conditions and meets demands through releases from an expanded Los Vaqueros Reservoir. The forgone Delta diversions are wheeled through available capacity at the CVP Jones Pumping Plant and delivered to the refuges as additional environmental water supply.

TABLE C3-6:
REFUGE DEMANDS BY MONTH (TAF)

Month	San Joaquin Valley	Tulare Basin	Total
January	7.2	1.3	8.4
February	6.2	1.1	7.3
March	3.5	0.6	4.1
April	3.5	0.6	4.1
May	9.5	1.7	11.2
June	6.3	1.1	7.4
July	4.5	0.8	5.3
August	7.8	1.4	9.1
September	28.1	5.0	33.1
October	27.7	4.9	32.6
November	13.2	2.3	15.5
December	8.6	1.5	10.1
Total Annual (TAF/yr)	**126.0**	**22.3**	**148.2**

Water Supply Assumptions

CCWD Supply

On May 10, 2005, CCWD signed a long-term contract with Reclamation for delivery of up to 195,000 acre-feet of water per year for M&I uses in the CCWD service area. The contract expires in 2045. Through a settlement agreement with EBMUD, CCWD may receive a portion of its CVP supplies from the existing intertie with the Mokelumne Aqueduct. This settlement agreement supply is outlined in Table C3-1. The CVP annual allocation to north-of-Delta (NOD) M&I water service contractors is assigned for the contract year beginning in March and ending in February and is taken from CalSim II. For modeling purposes and the allocation of shortages, it is considered that CCWD facilities are NOD.

D-1629, issued on June 2, 1994, gives CCWD the rights to divert and store water for beneficial uses. Under SWRCB Water Right Permits No. 20749 and 20750, CCWD may fill Los Vaqueros Reservoir from the intake at Old River and divert and store water from Kellogg Creek.

These rights are in addition to the contractual rights to divert and store CVP contract water. Up to 95,850 acre-feet per year may be diverted for storage between November 1 and June 30 at a maximum rate of 200 cfs. Diversion is limited to periods when the Delta is in excess water conditions under the Coordinated Operations Agreement when those diversions will not adversely impact the operations of the SWP and CVP. CCWD may also divert water under its CVP water supply contract to storage in Los Vaqueros Reservoir throughout the year. CCWD diversions and filling of the reservoir are also subject to the provisions of the 1993 delta smelt and chinook salmon BOs.

The water right permit for filling Los Vaqueros Reservoir includes the diversion and storage of water from Kellogg Creek (up to 9,640 acre-feet per year). The simulated inflow from Kellogg Creek was defined as part of the modeling effort conducted for the 2004 Project Planning Report (CCWD, DWR, Reclamation, 2004). For the period of October 1921 to September 2003, Kellogg Creek inflow varies between 0 and 9,000 acre-feet per year, with an average of approximately 1,400 acre-feet per year; 96 percent of the inflow occurs from December to April.

CCWD can divert up to 26,780 acre-feet per year of water from Mallard Slough under its own water rights (SWRCB Water Right License No. 317 and Permit No. 19856). Diversions under this water right are not explicitly modeled in this study. The City of Antioch and several industrial customers of CCWD have water right permits to divert water from the Delta. These diversions are included in the CalSim II model through CCWD's diversions, and to some extent through the Delta Island Consumptive Use (DICU) estimates.

Historically, CCWD has relied on water transfers to supplement its CVP contract allocation. For example, in 2003, CCWD purchased 5,000 acre-feet from Yuba County Water Agency and CCWD regularly uses water under its contract with East Contra Costa Irrigation District. The availability of water from single-year transfer agreements is represented indirectly. In the operations modeling, water transfers are represented to a limited extent. It is assumed that transfer water is available once CCWD has depleted its annual CVP allocation. Typically, CCWD will purchase an amount of water equal to the difference between its annual demand and its CVP allocation, consistent with CCWD's Future Water Supply Implementation EIR.

Operational Constraints

San Luis Reservoir

Storage in San Luis Reservoir plays a role in the delivery of refuge and SCVWD CVP water from the Los Vaqueros facilities in Alternative 2 because these supplies are temporarily stored in San Luis Reservoir for use in later months to match the monthly demand patterns. It has been assumed that other similar environmental water programs would also rely on San Luis Reservoir operations.

Preference is given to storing CVP and SWP water in San Luis Reservoir, so current and future available storage in San Luis Reservoir is evaluated in the model used in this EIS/EIR to ensure that Los Vaqueros supplies (refuge and SCVWD CVP) stored in San Luis Reservoir are not "spilled" in later months because of San Luis Reservoir reaching the top of the conservation pool. For modeling purposes, a perfect forecast of the storage at the end of the filling cycle was used to avoid spilling. During CalSim II simulation, a cumulative account of stored Los Vaqueros water in San Luis Reservoir is maintained. In any given month, the allowable releases from the project facilities cannot exceed the following:

- The annual demand (the sum of refuge and SCVWD CVP reliability demands and SCVWD April CVP allocation for M&I use), accounting for all deliveries made in previous months of that year.

- The available storage capacity in San Luis Reservoir (including the cumulative Los Vaqueros account) less the sum of refuge and SCVWD CVP demands for that month.

- The projected available storage capacity in San Luis Reservoir (including the cumulative Los Vaqueros account) at the end of the filling cycle minus total annual demands (refuge plus SCVWD CVP reliability plus SCVWD CVP M&I April allocation).

When there are no Los Vaqueros supplies in San Luis Reservoir, Los Vaqueros Reservoir can be used to meet SCVWD CVP and refuge demands. When Los Vaqueros Reservoir is at or below 80 TAF, no deliveries are made to either of these entities.

Los Vaqueros Reservoir

As described in Chapter 2.1.2, existing biological opinions for the Los Vaqueros Project impose certain restrictions on operations of the Los Vaqueros system and CCWD's Delta diversions, including an annual 75-day no-fill period and a concurrent 30-day no-diversion period. The default dates for the no-fill and no-diversion periods are March 15 through May 31 and April 1 through April 30, respectively. Per the biological opinions, these restrictions are waived if storage in Los Vaqueros Reservoir is at or below emergency levels of 70 TAF in wet, above-normal, or below normal water years, and 44 TAF in dry or critically dry water years. In the CalSim II modeling for this Draft EIS/EIR, the default no-fill and no-diversion periods are applied in CCWD operations for the Existing and Future Without Project conditions and for Alternative 4. For Alternatives 1, 2 and 3, a 30-day no diversion period was assumed to be in effect.

In all scenarios, water is preferentially diverted at the Old River, AIP and (in the case of Alternative 1 and 2) new Delta intakes, over the Rock Slough intake, unless this preference results in a reduction in total diversions. This maximizes use of currently screened intakes.

The operations model fills Los Vaqueros Reservoir with water from the Delta of up to 65 mg/L chloride concentration. Due to evaporation, it is possible for Los Vaqueros Reservoir to exceed 65 mg/L chloride concentration; under such a circumstance, filling with water above 65 mg/L chloride concentration is allowed as long as it lowers the salinity in the reservoir.

The increased number of available intakes in the Delta with the construction of the AIP Intake and the potential new Delta Intake provides increased flexibility to respond to the results of fish monitoring by allow greater flexibility in the point(s) of diversion. The benefits of this added flexibility have been determined through a post processing to the CalSim II results to allow a shift in diversions from intakes where fish densities are higher (according to historical survey and salvage data) to intakes where fish densities are lower (See Appendix C-7).

Alternatives 1 & 2

To improve fish screening in Delta diversions, Alternative 1 shifts the pumping of SWP and CVP supplies for South Bay water agencies to the more effectively screened Los Vaqueros Reservoir system intakes from the existing SWP or CVP export facilities. Alternative 1 also provides Delta supply restoration for these same agencies through direct diversions or by making releases from Los Vaqueros Reservoir. Alternative 2 performs the same improved fish screening operations as Alternative 1. It also provides environmental water supplies for refuges, wildlife areas, and wetlands in the San Joaquin Valley.

In the modeling for Alternatives 1 and 2, first priority was given to improved fish screening operations, as governed by the following assumed operational rules:

- A 30-day no-diversion period is observed in the spring (April) of each year at CCWD intakes (other than to meet CCWD service area demands when storage in Los Vaqueros Reservoir is at or below emergency levels). Deliveries to the SBA and SCVWD are made through releases from Los Vaqueros Reservoir during these no-diversion periods.

- During periods of suitable water quality (< 65 mg/L chloride at CCWD intakes), filling of Los Vaqueros Reservoir is given priority over deliveries to South Bay water agencies under improved fish screening operations.

- Delivery of CVP/SWP contract water to South Bay water agencies through the expanded Los Vaqueros system is limited to the exports at Banks Pumping Plant and Jones Pumping Plant that would have occurred to deliver water to the SBA and SCVWD in the absence of the project. These deliveries are augmented with Delta Supply Restoration in Alternative 1 only, as described above in the discussion of water demand assumptions.

- Water deliveries to South Bay water agencies that are shifted from Banks and Jones pumping plants to the Los Vaqueros system are assumed to be diverted from the Delta year-round, with the exception of the 30-day no-diversion period, as described above. Additional deliveries for Delta Supply Restoration that are made in Alternative 1 only are assumed to be diverted directly from the Delta when surplus water is available, and are assumed to be released from Los Vaqueros Reservoir when the Delta is in balanced conditions.

- Delivery of CVP/SWP contract water to South Bay water agencies through the expanded Los Vaqueros system is given conveyance capacity priority (to Bethany Reservoir) over deliveries for Delta Supply Restoration in Alternative 1.

- Releases are made from Los Vaqueros Reservoir to the South Bay water agencies during the 30-day no diversion period, when direct delivery via direct diversion at Rock Slough, Old River, AIP and the new Delta Intakes is precluded by the no-diversion period, and when storage is Los Vaqueros Reservoir is above 80 TAF. If storage in Los Vaqueros Reservoir is below 80 TAF during this period, the South Bay water agency contract deliveries are made through Banks and Jones Pumping Plants. The use of 80 TAF as a threshold to stop reservoir releases to the South Bay water agencies was intended to preserve CCWD's existing benefit in the reservoir.

- Reduction in exports are made at Banks Pumping Plant equal to the volume of water wheeled through Los Vaqueros diversion facilities or released from Los Vaqueros Reservoir to meet SWP/CVP contract allocations.
- SWP is compensated for wheeling of CVP water through LV facilities, and corresponding reduction in exports at Banks Pumping Plant, through reassignment of storage in San Luis Reservoir from CVP water to SWP water.
- Wheeled water is subject to the E/I standard. D-1641 specifies export limits in the form of an E/I ratio, and defines export as the combined inflow rate to Clifton Court Forebay and the export rate of the Jones Pumping Plant. CCWD is considered an in-Delta diverter, not an exporter; therefore the project diversions used by CCWD are not constrained by the E/I ratio. For modeling purposes, water deliveries to South Bay water agencies that are shifted from Banks or Jones export facilities to the Los Vaqueros system in Alternatives 1 and 2 are assumed to be limited by E/I requirements.

Delta Supply Restoration demands (Alternative 1) or environmental water supply deliveries (Alternative 2) would be met through additional diversions at project facilities during Delta excess conditions, either for direct delivery or for storage in Los Vaqueros Reservoir for later release. Assumed operating rules for these diversions and deliveries are as follows:

- Deliveries from Los Vaqueros facilities for Delta supply restoration (Alternative 1) or environmental water supply (Alternative 2) are secondary to deliveries to South Bay water agencies under improved fish screening operations.
- During periods of suitable water quality (< 65 mg/L chloride), filling of Los Vaqueros Reservoir is given priority over delivery of Delta Supply Restoration or environmental water supply.
- Diversions for direct delivery are limited by existing X2 requirements.
- Releases from Los Vaqueros Reservoir for refuge supply are restricted when Los Vaqueros Reservoir storage is at or below 80 TAF.

Alternative 3

As modeled under Alternative 3, CCWD would forego Delta diversions to provide water supplies for environmental use by relying on supplies from an expanded Los Vaqueros Reservoir when the following conditions are met:

- Balanced water conditions exist in the Delta from December through June
- Storage in Los Vaqueros Reservoir is above 80,000 acre-feet
- Delta diversions foregone by CCWD can be retained in Shasta Reservoir without being released to meet instream flow requirements

Water retained in Shasta Reservoir in this manner would increase water storage in the summer, which would help maintain the cold water pool needed for temperature control in the Sacramento River in summer and fall. Water stored in Shasta Reservoir in this manner would be conveyed through the Delta for south-of-Delta environmental purposes, such as delivery for Level 4 refuge water supply, when there is available capacity at the CVP/SWP export pumps, as limited by permit conditions at Jones Pumping Plant.

Alternative 4

Under Alternative 4, CCWD would operate an expanded Los Vaqueros Reservoir for blending purposes and water supply reliability. Operational criteria would be as described for the No Action/No Project Alternative.

C-4 MODEL RESULTS – WATER SUPPLY AND MANAGEMENT

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Tables

Figures

Introduction

This appendix presents a summary of CalSim II model results for the project alternatives. For 2005 level of development, the project alternatives are compared to the Existing Condition. For 2030 level of development, the project alternatives are compared to the Future Without Project condition.

2005 Level of Development, Severe Fishery Restrictions

Model results for each project alternative are presented in **Table C4-1(A-D)** as average values for the full hydrologic study period (1921 to 2003) and a six-year dry period (1987 to 1992). These results include upstream and Delta flows and diversions (e.g. flow in Sacramento River and major tributaries, San Joaquin River flow, exports at Banks and Jones Pumping Plants, Net Delta Outflow, X2 position and QWEST), CVP and SWP south of Delta deliveries, CVP and SWP reservoir carry-over storages (at Folsom, Oroville, San Luis, Shasta and Trinity Reservoirs), and parameters specific to project alternative operations (CCWD and Los Vaqueros Reservoir (LV) diversions; additional south of Delta Environmental Water Supply deliveries; and Delta Supply Restoration deliveries to South Bay water agencies).

Table C4-2 and **Table C4-3** present the change in Delta channel flows and indices, upstream reservoir storages and local operation parameters for each project alternative as compared to the Existing Condition. Results are summarized in these tables as averages by water year type and by month, respectively.

Table C4-4 (A-D) presents the changes from the Existing Condition in monthly Banks and Jones export diversions for each project alternative, and **Table C4-5 (A-D)** presents the changes from the Existing Condition in monthly CCWD and Los Vaqueros Reservoir (LV) diversions for each project alternative. These tables also indicate whether the Delta is in excess or balanced conditions.

Monthly and year type average changes in various Delta parameters (Sacramento River flow at Hood, San Joaquin River flow at Vernalis, Delta Outflow, combined Banks and Jones diversions, and combined CCWD and LV diversions) are presented in **Figure C4-1** through **Figure C4-5** and **Figure C4-11** through **Figure C4-15**, respectively. **Figure C4-6** shows the monthly average Los Vaqueros storage and **Figure C4-7** through **Figure C4-10** show time-series of storage for each alternative and the Existing Conditions.

Figure C4-16 through **Figure C4-21** are exceedence plots of the end of September storage in upstream reservoirs (Trinity, Shasta, Oroville, and Folsom) and San Luis Reservoir (CVP and SWP).

TABLE C4-1: SUMMARY COMPARISON OF ANNUAL AVERAGE DIVERSIONS, DELIVERIES, RIVER FLOWS, AND CARRYOVER STORAGE, 2005 LOD, SEVERE FISHERY RESTRICTIONS

(A) ALTERNATIVE 1 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 1		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	133	362	278	235	145	184%	109%
Banks Pumping Plant	2626	1508	2421	1374	-205	-133	-8%	-9%
Jones Pumping Plant	2151	1722	2153	1722	2	0	0%	0%
Total	4904	3363	4936	3375	32	12	1%	0%
Delta (cfs)								
Sacramento River at Hood	22,408	12,922	22,406	12,920	-2	-2	0%	0%
San Joaquin River at Vernalis	4,284	1,595	4,284	1,595	0	0	0%	0%
Delta Outflow	22,461	8,648	22,417	8,630	-44	-18	0%	0%
QWEST	3,258	223	3,215	212	-42	-11	-1%	-5%
X2 Position (km)	74.82	81.53	74.86	81.55	0.04	0.01	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,550	6,310	8,549	6,311	-1	1	0%	0%
American River below Nimbus Dam	3,491	1,651	3,490	1,651	0	0	0%	0%
Feather River below Thermalito	4,402	2,324	4,402	2,320	0	-4	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,419	841	1,422	836	3	-5	0%	-1%
Shasta	2,798	1,798	2,789	1,780	-8	-18	0%	-1%
Oroville	2,183	1,248	2,184	1,255	1	7	0%	1%
Folsom	544	344	541	338	-2	-6	0%	-2%
CVP San Luis (August)	158	94	159	94	1	0	1%	0%
SWP San Luis (August)	244	119	243	119	0	0	0%	0%
Deliveries (TAF/yr)								
CVP SOD Ag	823	393	823	393	1	-1	0%	0%
CVP SOD M&I	114	99	114	100	0	1	0%	1%
SWP Table A + Article 56	2,486	1,467	2,486	1,480	0	13	0%	1%
SWP Article 21	85	0	85	0	0	0	0%	NA
Delta Supply Restoration + Dry Year	0	0	27	30	27	30	NA	NA

(B) ALTERNATIVE 2 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 2		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	133	381	291	253	158	199%	119%
Banks Pumping Plant	2626	1508	2425	1373	-201	-135	-8%	-9%
Jones Pumping Plant	2151	1722	2151	1720	0	-2	0%	0%
Total	4904	3363	4957	3384	52	21	1%	1%
Delta (cfs)								
Sacramento River at Hood	22,408	12,922	22,410	12,920	2	-2	0%	0%
San Joaquin River at Vernalis	4,284	1,595	4,284	1,595	0	0	0%	0%
Delta Outflow	22,461	8,648	22,390	8,618	-71	-30	0%	0%
QWEST	3,258	223	3,189	199	-69	-24	-2%	-11%
X2 Position (km)	75	82	75	82	0	0	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,550	6,310	8,549	6,313	-1	3	0%	0%
American River below Nimbus Dam	3,491	1,651	3,491	1,651	0	0	0%	0%
Feather River below Thermalito	4,402	2,324	4,402	2,317	0	-8	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,419	841	1,420	834	2	-7	0%	-1%
Shasta	2,798	1,798	2,788	1,771	-10	-27	0%	-1%
Oroville	2,183	1,248	2,181	1,257	-2	9	0%	1%
Folsom	544	344	541	338	-2	-6	0%	-2%
CVP San Luis (August)	158	94	158	94	1	0	1%	0%
SWP San Luis (August)	244	119	243	119	0	0	0%	0%
Deliveries (TAF/yr)								
CVP SOD Ag	823	393	822	391	-1	-3	0%	-1%
CVP SOD M&I	114	99	114	100	0	1	0%	1%
SWP Table A + Article 56	2,486	1,467	2,484	1,478	-1	11	0%	1%
SWP Article 21	85	0	85	0	-1	0	-1%	NA
Additional SOD Env Water Supply	0	0	51	43	51	43	NA	NA

TABLE C4-1:
SUMMARY COMPARISON OF ANNUAL AVERAGE DIVERSIONS, DELIVERIES, RIVER FLOWS, AND CARRYOVER STORAGE, 2005 LOD, SEVERE FISHERY RESTRICTIONS

(C) ALTERNATIVE 3 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 3		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	133	130	106	3	-27	2%	-21%
Banks Pumping Plant	2626	1508	2643	1515	17	8	1%	1%
Jones Pumping Plant	2151	1722	2155	1740	4	18	0%	1%
Total	4904	3363	4928	3361	24	-2	0%	0%
Delta (cfs)								
Sacramento River at Hood	22,408	12,922	22,406	12,921	-2	0	0%	0%
San Joaquin River at Vernalis	4,284	1,595	4,284	1,595	0	0	0%	0%
Delta Outflow	22,461	8,648	22,424	8,651	-38	3	0%	0%
QWEST	3,258	223	3,225	231	-33	8	-1%	4%
X2 Position (km)	75	82	75	82	0	0	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,550	6,310	8,547	6,299	-2	-11	0%	0%
American River below Nimbus Dam	3,491	1,651	3,491	1,656	0	5	0%	0%
Feather River below Thermalito	4,402	2,324	4,402	2,326	0	1	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,419	841	1,424	852	6	11	0%	1%
Shasta	2,798	1,798	2,796	1,803	-1	5	0%	0%
Oroville	2,183	1,248	2,178	1,246	-5	-3	0%	0%
Folsom	544	344	542	332	-2	-12	0%	-3%
CVP San Luis (August)	158	94	157	94	0	0	0%	0%
SWP San Luis (August)	244	119	244	114	0	-5	0%	-5%
Deliveries (TAF/yr)								
CVP SOD Ag	823	393	823	394	1	1	0%	0%
CVP SOD M&I	114	99	114	99	0	0	0%	0%
SWP Table A + Article 56	2,486	1,467	2,492	1,473	6	7	0%	0%
SWP Article 21	85	0	93	0	8	0	9%	NA
Additional SOD Env Water Supply	0	0	7	24	7	24	NA	NA

(D) ALTERNATIVE 4 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 4		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	133	128	124	1	-9	1%	-7%
Banks Pumping Plant	2626	1508	2628	1510	2	2	0%	0%
Jones Pumping Plant	2151	1722	2153	1729	2	7	0%	0%
Total	4904	3363	4909	3363	5	0	0%	0%
Delta (cfs)								
Sacramento River at Hood	22,408	12,922	22,410	12,915	2	-7	0%	0%
San Joaquin River at Vernalis	4,284	1,595	4,284	1,595	0	0	0%	0%
Delta Outflow	22,461	8,648	22,452	8,642	-9	-7	0%	0%
QWEST	3,258	223	3,251	224	-7	1	0%	0%
X2 Position (km)	75	82	75	82	0	0	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,550	6,310	8,548	6,307	-1	-3	0%	0%
American River below Nimbus Dam	3,491	1,651	3,491	1,651	0	0	0%	0%
Feather River below Thermalito	4,402	2,324	4,402	2,322	0	-2	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,419	841	1,421	850	2	9	0%	1%
Shasta	2,798	1,798	2,800	1,804	2	6	0%	0%
Oroville	2,183	1,248	2,180	1,251	-3	2	0%	0%
Folsom	544	344	543	345	0	1	0%	0%
CVP San Luis (August)	158	94	157	94	-1	0	0%	0%
SWP San Luis (August)	244	119	243	119	0	0	0%	0%
Deliveries (TAF/yr)								
CVP SOD Ag	823	393	825	399	2	6	0%	2%
CVP SOD M&I	114	99	114	100	0	1	0%	1%
SWP Table A + Article 56	2,486	1,467	2,488	1,469	2	2	0%	0%
SWP Article 21	85	0	86	0	0	0	0%	NA

**TABLE C4-2:
ANNUAL VALUES BY WATER YEAR TYPE, 2005 LOD, SEVERE FISHERY RESTRICTIONS**

Parameter	Long Term Average	Dry Period (87-92)	Wet	Above Normal	Below Normal	Dry	Critical
CCWD and LV Diversions (TAF/yr)							
Average Total Diversions Existing Condition	**127**	**133**	**122**	**137**	**136**	**129**	**116**
Changes under Alternative 1	235	145	279	243	242	224	137
Changes under Alternative 2	253	158	300	265	262	239	152
Changes under Alternative 3	3	-27	12	18	9	2	-36
Changes under Alternative 4	1	-9	8	8	1	-8	-9
Improved Fish Screening Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	189	135	228	188	190	167	139
Changes under Alternative 2	184	135	222	184	180	163	138
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Delta (cfs)							
Sacramento River at Hood Existing Condition	**22,408**	**12,922**	**33,127**	**25,434**	**18,639**	**15,481**	**10,943**
Changes under Alternative 1	-2	-2	-17	16	8	7	-14
Changes under Alternative 2	2	-2	-18	22	13	17	-8
Changes under Alternative 3	-2	0	-12	1	7	14	-19
Changes under Alternative 4	2	-7	3	0	2	-2	8
San Joaquin River at Vernalis Existing Condition	**4,284**	**1,595**	**7,529**	**4,016**	**3,336**	**2,244**	**1,686**
Changes under Alternative 1	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Delta Outflow Existing Condition	**22,461**	**8,648**	**40,636**	**24,479**	**15,117**	**10,915**	**6,955**
Changes under Alternative 1	-44	-18	-65	-30	-44	-42	-16
Changes under Alternative 2	-71	-30	-110	-70	-58	-58	-21
Changes under Alternative 3	-38	3	-57	-27	-41	-26	-19
Changes under Alternative 4	-9	-7	-18	-19	6	-10	5
Banks Pumping Plant Existing Condition	**3,617**	**2,082**	**4,677**	**3,807**	**3,545**	**3,101**	**1,991**
Changes under Alternative 1	-282	-184	-339	-285	-283	-255	-193
Changes under Alternative 2	-278	-186	-330	-281	-279	-249	-202
Changes under Alternative 3	24	11	24	3	34	21	39
Changes under Alternative 4	4	3	1	-1	-1	10	11
Jones Pumping Plant Existing Condition	**2,964**	**2,378**	**3,443**	**3,084**	**2,943**	**2,719**	**2,198**
Changes under Alternative 1	2	0	4	2	2	-4	7
Changes under Alternative 2	-1	-2	4	-1	-10	-4	6
Changes under Alternative 3	5	25	-1	-3	2	18	10
Changes under Alternative 4	3	10	0	5	-4	9	4
Banks + Jones Exports Existing Condition	**6,581**	**4,461**	**8,119**	**6,891**	**6,489**	**5,820**	**4,189**
Changes under Alternative 1	-280	-184	-335	-283	-281	-259	-187
Changes under Alternative 2	-278	-189	-326	-282	-289	-253	-196
Changes under Alternative 3	29	35	24	0	36	39	49
Changes under Alternative 4	6	13	1	4	-5	19	15
Banks + Jones + CCWD + LV Diversions Existing Condition	**6,757**	**4,644**	**8,288**	**7,080**	**6,676**	**5,997**	**4,348**
Changes under Alternative 1	43	16	49	51	52	49	2
Changes under Alternative 2	70	28	87	83	71	75	14
Changes under Alternative 3	33	-3	40	24	48	41	-1
Changes under Alternative 4	7	0	12	15	-4	7	2
QWEST Existing Condition	**3,258**	**223**	**7,543**	**3,285**	**1,654**	**293**	**265**
Changes under Alternative 1	-42	-11	-52	-47	-49	-45	-4
Changes under Alternative 2	-69	-24	-90	-78	-66	-69	-15
Changes under Alternative 3	-33	8	-42	-22	-47	-35	-3
Changes under Alternative 4	-7	1	-12	-15	4	-7	-1
X2 Position (km) Existing Condition	**74.82**	**81.53**	**68.47**	**73.01**	**76.20**	**78.96**	**82.53**
Changes under Alternative 1	0.04	0.01	0.05	0.02	0.04	0.05	0.02
Changes under Alternative 2	0.06	0.02	0.07	0.05	0.04	0.06	0.03
Changes under Alternative 3	0.02	0.00	0.04	0.01	0.02	0.02	0.01
Changes under Alternative 4	0.00	0.01	0.01	0.01	0.00	0.01	-0.01
Upstream River Flows (cfs)							
Sacramento River at Keswick Existing Condition	**8,550**	**6,310**	**11,630**	**8,688**	**7,033**	**6,798**	**6,134**
Changes under Alternative 1	-1	1	-13	13	16	7	-18
Changes under Alternative 2	-1	3	-17	12	13	12	-15
Changes under Alternative 3	-2	-11	-15	11	15	13	-31
Changes under Alternative 4	-1	-3	-3	10	-3	-3	-4
American River below Nimbus Existing Condition	**3,491**	**1,651**	**5,476**	**3,901**	**2,958**	**2,144**	**1,419**
Changes under Alternative 1	0	0	-1	1	-7	5	-1
Changes under Alternative 2	0	0	-1	1	-8	6	0
Changes under Alternative 3	0	5	0	-1	2	1	-2
Changes under Alternative 4	0	0	0	0	-2	1	0

TABLE C4-2:
ANNUAL VALUES BY WATER YEAR TYPE, 2005 LOD, SEVERE FISHERY RESTRICTIONS

Parameter	Long Term Average	Dry Period (87-92)	Wet	Above Normal	Below Normal	Dry	Critical
Feather River below Thermalito							
Existing Condition	**4,402**	**2,324**	**6,783**	**4,419**	**3,529**	**3,059**	**2,261**
Changes under Alternative 1	0	-4	-3	9	1	-6	5
Changes under Alternative 2	0	-8	-6	1	6	-2	7
Changes under Alternative 3	0	1	3	-12	-9	0	16
Changes under Alternative 4	0	-2	-2	-14	4	0	12
Reservoir Carryover Storage (TAF)							
Trinity Existing Condition	**1,419**	**841**	**1,863**	**1,645**	**1,298**	**1,172**	**743**
Changes under Alternative 1	3	-5	0	6	8	3	5
Changes under Alternative 2	2	-7	0	2	3	1	4
Changes under Alternative 3	6	11	1	12	9	2	11
Changes under Alternative 4	2	9	0	1	3	1	7
Shasta Existing Condition	**2,798**	**1,798**	**3,344**	**3,245**	**2,920**	**2,522**	**1,438**
Changes under Alternative 1	-8	-18	0	-5	-26	-12	-4
Changes under Alternative 2	-10	-27	-1	-5	-26	-14	-10
Changes under Alternative 3	-1	5	-1	-4	-10	-9	21
Changes under Alternative 4	2	6	0	0	5	2	6
Oroville Existing Condition	**2,183**	**1,248**	**3,055**	**2,453**	**2,068**	**1,530**	**1,137**
Changes under Alternative 1	1	7	2	-2	1	3	0
Changes under Alternative 2	-2	9	1	-3	-13	0	-1
Changes under Alternative 3	-5	-3	-1	-3	-2	-8	-17
Changes under Alternative 4	-3	2	-1	-1	-4	-1	-8
Folsom Existing Condition	**544**	**344**	**646**	**609**	**584**	**465**	**326**
Changes under Alternative 1	-2	-6	0	-1	-2	-7	-1
Changes under Alternative 2	-2	-6	0	-1	-2	-8	-1
Changes under Alternative 3	-2	-12	0	0	-2	-5	-1
Changes under Alternative 4	0	1	0	0	0	-1	1
CVP San Luis (August) Existing Condition	**158**	**94**	**223**	**146**	**123**	**114**	**134**
Changes under Alternative 1	1	0	1	-2	7	-1	2
Changes under Alternative 2	1	0	1	-2	5	-1	2
Changes under Alternative 3	0	0	1	-2	3	-2	-1
Changes under Alternative 4	-1	0	0	0	-5	0	0
SWP San Luis (August) Existing Condition	**244**	**119**	**473**	**167**	**137**	**132**	**115**
Changes under Alternative 1	0	0	1	-3	-1	0	0
Changes under Alternative 2	0	0	1	-3	-1	0	0
Changes under Alternative 3	0	-5	3	-5	0	-2	0
Changes under Alternative 4	0	0	-1	-1	0	0	0
CVP and SWP Deliveries (TAF/year)							
CVP SOD Ag Existing Condition	**823**	**393**	**1,256**	**892**	**740**	**551**	**319**
Changes under Alternative 1	1	-1	5	3	-3	1	-5
Changes under Alternative 2	-1	-3	4	1	-10	0	-6
Changes under Alternative 3	1	1	1	1	-4	3	1
Changes under Alternative 4	2	6	0	-2	2	8	2
CVP SOD M&I Existing Condition	**114**	**99**	**128**	**112**	**112**	**108**	**96**
Changes under Alternative 1	0	1	0	0	0	1	0
Changes under Alternative 2	0	1	0	-1	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	1	0	0	0	0	0
SWP Table A + Article 56 Existing Condition	**2,486**	**1,467**	**3,025**	**2,627**	**2,576**	**2,267**	**1,399**
Changes under Alternative 1	0	13	0	-1	-1	-3	8
Changes under Alternative 2	-1	11	0	-2	-2	-5	2
Changes under Alternative 3	6	7	-2	-3	8	9	26
Changes under Alternative 4	2	2	0	-2	-1	7	9
SWP Article 21 Existing Condition	**85**	**0**	**191**	**76**	**50**	**21**	**3**
Changes under Alternative 1	0	0	0	0	1	0	0
Changes under Alternative 2	-1	0	0	0	-3	0	0
Changes under Alternative 3	8	0	18	2	12	0	0
Changes under Alternative 4	0	0	1	0	0	0	0
Improved Fish Screening for CVP South Bay	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	76	73	79	75	77	73	73
Changes under Alternative 2	74	74	76	73	74	71	74
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Improved Fish Screening for SWP South Bay	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	129	71	167	129	129	108	76
Changes under Alternative 2	125	70	164	126	122	105	76
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
CVP Delta Supply Restoration							
Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	6	5	5	5	6	8	8
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0

TABLE C4-2:
ANNUAL VALUES BY WATER YEAR TYPE, 2005 LOD, SEVERE FISHERY RESTRICTIONS

Parameter	Long Term Average	Dry Period (87-92)	Wet	Above Normal	Below Normal	Dry	Critical
SWP Delta Supply Restoration Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	21	25	12	13	15	27	44
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Additional CVP SOD Environmental Water from Dedicated Storage Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	0	0	0	0	0	0	0
Changes under Alternative 2	51	43	42	43	50	64	64
Changes under Alternative 3	7	24	1	4	5	19	8
Changes under Alternative 4	0	0	0	0	0	0	0

TABLE C4-3:
AVERAGE MONTHLY VALUES, 2005 LOD, SEVERE FISHERY RESTRICTIONS

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CCWD and LV Diversions (TAF)												
Average Total Diversions Existing Condition	**7**	**6**	**6**	**6**	**7**	**7**	**2**	**11**	**22**	**22**	**18**	**12**
Changes under Alternative 1	13	17	20	21	17	27	-2	33	20	22	23	25
Changes under Alternative 2	15	20	24	25	19	28	-1	33	21	23	23	25
Changes under Alternative 3	-1	-1	0	0	1	1	-2	7	-6	4	0	0
Changes under Alternative 4	0	0	0	0	0	0	-1	0	0	0	1	0
Improved Fish Screening Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	12	15	18	19	14	23	0	10	14	18	22	24
Changes under Alternative 2	12	15	17	19	14	22	0	10	13	17	22	23
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Delta (cfs)												
Sacramento River at Hood Existing Condition	**11,910**	**15,539**	**25,741**	**34,475**	**40,240**	**34,931**	**24,085**	**19,836**	**15,575**	**18,272**	**14,880**	**13,410**
Changes under Alternative 1	-10	-33	-18	-13	-25	10	-40	33	76	69	-56	-17
Changes under Alternative 2	-12	-35	-22	-18	-8	-7	-37	25	86	125	-35	-34
Changes under Alternative 3	-20	-1	-23	-16	13	-9	-28	-9	-59	27	-2	103
Changes under Alternative 4	-1	5	10	3	-6	4	-16	0	-5	8	18	3
San Joaquin River at Vernalis Existing Condition	**2,547**	**2,731**	**3,484**	**4,857**	**6,598**	**6,478**	**6,022**	**6,065**	**4,681**	**3,244**	**2,129**	**2,570**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Delta Outflow Existing Condition	**5,161**	**9,743**	**24,095**	**43,797**	**55,745**	**46,645**	**29,756**	**22,275**	**14,065**	**8,116**	**4,652**	**5,488**
Changes under Alternative 1	-39	-56	-62	-10	-75	-51	137	-319	-23	30	-29	-31
Changes under Alternative 2	-73	-104	-150	-47	-124	-93	135	-338	-37	42	-26	-38
Changes under Alternative 3	-29	-7	-126	-114	-15	-47	-11	-130	38	-20	-3	12
Changes under Alternative 4	-3	14	-26	-81	-14	2	8	8	-8	1	4	-12
Banks Pumping Plant Existing Condition	**4,312**	**4,755**	**4,875**	**4,088**	**3,401**	**2,193**	**1,280**	**1,471**	**1,401**	**5,168**	**5,522**	**4,944**
Changes under Alternative 1	-196	-262	-302	-317	-256	-366	-237	-166	-232	-294	-364	-389
Changes under Alternative 2	-192	-265	-298	-345	-250	-354	-233	-161	-217	-261	-355	-401
Changes under Alternative 3	-4	24	72	77	5	34	24	8	-1	-3	-7	63
Changes under Alternative 4	-2	-6	12	32	-5	0	2	-1	0	4	3	3
Jones Pumping Plant Existing Condition	**3,963**	**3,965**	**3,683**	**3,555**	**2,649**	**1,789**	**1,372**	**1,390**	**1,208**	**3,866**	**4,092**	**4,033**
Changes under Alternative 1	8	3	7	2	-9	-2	90	-13	-3	-25	-29	-9
Changes under Alternative 2	7	3	11	-25	-2	-2	88	-14	-5	-29	-31	-9
Changes under Alternative 3	25	-3	16	32	-8	-10	-11	-5	0	-8	0	34
Changes under Alternative 4	2	1	0	31	10	3	-11	0	0	-5	-1	3
Banks + Jones Exports Existing Condition	**8,275**	**8,719**	**8,558**	**7,643**	**6,050**	**3,982**	**2,652**	**2,861**	**2,609**	**9,034**	**9,614**	**8,977**
Changes under Alternative 1	-188	-259	-295	-314	-264	-368	-147	-178	-235	-319	-393	-398
Changes under Alternative 2	-186	-262	-287	-370	-252	-355	-145	-174	-222	-289	-386	-409
Changes under Alternative 3	21	21	87	108	-3	24	13	3	-1	-11	-7	97
Changes under Alternative 4	0	-5	12	63	6	3	-9	-1	0	-1	2	6
Banks + Jones + CCWD + LV Diversions Existing Condition	**8,390**	**8,827**	**8,659**	**7,741**	**6,180**	**4,090**	**2,689**	**3,044**	**2,982**	**9,384**	**9,914**	**9,181**
Changes under Alternative 1	29	23	38	22	35	64	-175	353	99	39	-27	14
Changes under Alternative 2	55	67	105	38	93	94	-170	364	123	83	-9	4
Changes under Alternative 3	8	7	81	109	12	39	-17	121	-97	46	1	90
Changes under Alternative 4	1	-9	12	68	8	2	-24	-8	4	7	14	14

TABLE C4-3:
AVERAGE MONTHLY VALUES, 2005 LOD, SEVERE FISHERY RESTRICTIONS

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
QWEST Existing Condition	**-929**	**-929**	**1,395**	**6,159**	**9,780**	**9,815**	**8,085**	**6,456**	**5,097**	**-1,353**	**-2,944**	**-1,535**
Changes under Alternative 1	-30	-28	-41	-24	-38	-63	169	-348	-78	-19	10	-19
Changes under Alternative 2	-56	-72	-109	-41	-94	-95	165	-360	-99	-47	-1	-14
Changes under Alternative 3	-13	-6	-86	-111	-10	-40	13	-122	81	-38	-1	-60
Changes under Alternative 4	-1	9	-10	-67	-9	-1	22	8	-5	-4	-8	-14
X2 Position (km) Existing Condition	**85.09**	**85.39**	**82.44**	**76.93**	**69.63**	**64.10**	**63.27**	**66.17**	**69.29**	**73.92**	**78.19**	**83.37**
Changes under Alternative 1	0.05	0.05	0.06	0.04	0.03	0.03	0.03	-0.03	0.12	0.06	-0.02	0.04
Changes under Alternative 2	0.07	0.09	0.10	0.10	0.05	0.04	0.04	-0.03	0.14	0.07	-0.02	0.03
Changes under Alternative 3	-0.03	0.03	0.01	0.06	0.07	0.03	0.02	0.01	0.06	-0.01	0.02	0.01
Changes under Alternative 4	0.01	0.01	-0.01	-0.01	0.02	0.01	0.00	0.00	-0.01	0.01	0.00	-0.01
E/I Ratio Existing Condition	**0.57**	**0.52**	**0.42**	**0.27**	**0.14**	**0.09**	**0.08**	**0.10**	**0.10**	**0.41**	**0.54**	**0.57**
Changes under Alternative 1	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Changes under Alternative 2	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Changes under Alternative 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes under Alternative 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upstream River Flows (cfs)												
Sacramento River at Keswick Existing Condition	**6,233**	**5,899**	**7,359**	**8,707**	**10,924**	**8,733**	**6,979**	**7,822**	**10,193**	**12,961**	**10,288**	**6,498**
Changes under Alternative 1	-10	-19	-16	3	-9	6	-16	19	38	41	-20	-23
Changes under Alternative 2	-28	-17	-17	-1	-2	-1	-16	11	31	64	-12	-23
Changes under Alternative 3	-6	-8	-56	18	-10	1	-11	-8	-44	11	28	58
Changes under Alternative 4	0	1	-17	0	0	5	-4	3	-6	0	4	-3
American River below Nimbus Existing Condition	**1,764**	**2,790**	**3,486**	**4,559**	**5,298**	**3,836**	**3,461**	**3,889**	**3,625**	**3,859**	**2,698**	**2,622**
Changes under Alternative 1	-1	-8	-5	4	-21	1	-7	4	16	27	-24	12
Changes under Alternative 2	7	-14	-6	1	-18	-3	-8	4	25	42	-19	-12
Changes under Alternative 3	-3	-2	1	-8	0	-6	-4	-3	-9	33	-8	10
Changes under Alternative 4	-3	1	0	-3	2	1	0	0	0	1	3	-1
Feather River below Thermalito Existing Condition	**3,270**	**2,576**	**4,298**	**5,593**	**6,567**	**6,749**	**3,157**	**3,747**	**3,151**	**6,538**	**4,996**	**2,187**
Changes under Alternative 1	-1	-6	-4	3	-7	7	-13	7	23	7	-11	-8
Changes under Alternative 2	1	-7	-26	-11	-8	3	-11	8	30	26	-3	-3
Changes under Alternative 3	-7	6	26	-21	10	-1	-15	3	-3	-19	-18	39
Changes under Alternative 4	3	3	3	-15	-8	-2	-15	0	2	5	13	7
CVP and SWP Deliveries (TAF)												
CVP SOD Ag Existing Condition	**27**	**19**	**27**	**48**	**56**	**39**	**54**	**86**	**137**	**168**	**121**	**40**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	1	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	-1	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	1	0	0	0
CVP SOD M&I Existing Condition	**9**	**11**	**11**	**8**	**3**	**12**	**9**	**9**	**9**	**10**	**11**	**12**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
SWP Table A + Article 56 Existing Condition	**197**	**168**	**151**	**126**	**121**	**118**	**179**	**235**	**265**	**348**	**336**	**242**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	-1	0	0	0
Changes under Alternative 3	0	0	0	1	0	-2	1	1	2	1	1	1
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	1	0	0

TABLE C4-3:
AVERAGE MONTHLY VALUES, 2005 LOD, SEVERE FISHERY RESTRICTIONS

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SWP Article 21 Existing Condition	**6**	**7**	**7**	**11**	**22**	**18**	**5**	**3**	**1**	**1**	**1**	**3**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	1	2	5	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Improved Fish Screening for CVP South Bay Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	7	10	9	5	2	8	5	3	4	6	7	9
Changes under Alternative 2	7	10	9	5	2	8	5	3	4	5	7	9
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Improved Fish Screening for SWP South Bay Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	5	5	9	14	12	15	10	8	10	12	15	14
Changes under Alternative 2	5	5	9	14	12	14	10	7	9	11	14	14
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
CVP South Bay Delta Supply Restoration Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	1	1	1	1	0	1	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
SWP South Bay Delta Supply Restoration Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	4	3	3	0	1	1	0	1	2	0	2	3
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Additional CVP SOD Environmental Water from Dedicated Storage Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	13	10	6	4	5	2	1	2	2	1	2	3
Changes under Alternative 3	1	0	0	0	0	0	0	0	0	0	2	4
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0

TABLE C4-4:
CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(A) Alternative 1

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	-470	-395	-449	-163	-114	-431	-165	0	-354	-393	-426	-431
1923	-120	-241	-309	-479	-300	-470	-157	-138	-327	-377	-510	-412
1924	-164	-230	-299	-253	-214	-300	-133	-172	-194	-111	-147	-154
1925	19	-336	-128	-95	-112	-300	0	0	0	54	-410	-423
1926	-217	-250	-298	-240	-210	-300	-143	-218	0	-240	-617	-342
1927	-125	-174	0	0	0	-189	-153	0	-190	-475	-347	-446
1928	-189	-268	-340	-468	-427	-469	-62	-219	-300	-329	-240	-393
1929	-152	-236	-280	-246	-213	-385	-119	-173	-194	-371	-454	-240
1930	48	-16	-134	0	0	-406	-243	-251	0	5	-343	-421
1931	-142	-205	-275	-218	-175	-300	-32	-155	-169	-202	-91	-214
1932	-120	-97	-128	0	-47	-338	0	0	0	0	-1034	-257
1933	-130	-165	-145	631	264	-350	-193	-178	-204	-70	-258	-212
1934	20	15	96	-667	0	-381	0	-202	0	0	-200	-319
1935	-155	34	-167	-121	-126	-351	0	0	-358	3	2	-366
1936	-257	-255	-310	-281	-249	0	-156	-322	-1	-272	-594	-279
1937	-299	-239	-44	-260	-504	-508	-322	-42	-261	-413	-230	-435
1938	-183	-244	-315	-939	-489	-468	-301	-223	-470	-482	-408	-470
1939	-529	-472	-471	-470	-89	-377	-9	-289	-300	-147	-555	-431
1940	-173	-190	-323	-191	-160	-439	-165	0	0	-622	-262	-424
1941	-165	-219	-305	-307	-289	-313	-271	-248	-430	-455	-481	-470
1942	-214	-306	-376	-465	-445	-470	-169	-232	-440	-477	-481	-469
1943	-222	-302	-465	-470	-314	-364	-316	-557	-451	-494	-494	-470
1944	-233	180	-878	-470	-439	-470	-143	-5	-188	-376	-512	-430
1945	-321	-211	-276	-240	-428	43	-147	-217	-300	-507	-105	-452
1946	-184	-254	-326	-455	-890	-470	-157	-219	-313	-388	-438	-395
1947	-148	-250	-284	-254	-223	-454	-143	0	0	-391	-422	-553
1948	-148	-233	-358	-364	-300	-411	-157	0	0	-314	-391	-370
1949	-160	-228	-266	-271	-199	-435	-268	-290	0	0	-406	-445
1950	-131	-225	-309	-252	0	-431	-157	0	-182	-361	-377	-334
1951	-150	-219	-285	-486	-464	-305	-85	-220	-398	-460	-457	-463
1952	-356	-265	-336	-453	-150	-469	-261	-222	-391	-429	-461	-470
1953	-466	-477	-356	-443	-167	-179	0	-215	-385	-272	-450	-437
1954	-180	-247	-320	-454	-422	-470	-165	-105	-300	-418	-261	-421
1955	-285	-234	-303	-214	-312	-470	-143	-252	-68	-534	-537	-549
1956	-134	-195	-267	-245	0	-468	-169	-225	-446	-489	-492	-467
1957	-225	-302	-332	-470	-470	-470	-320	-49	-212	-371	-392	-432
1958	-158	-228	-292	-323	-328	-330	-349	-241	-470	-482	-470	-470
1959	-287	-472	-470	-348	-470	-470	-26	-111	-300	-179	-391	-439
1960	-153	-216	-355	-299	-249	-401	-143	-272	0	0	-330	-425
1961	-149	-221	-529	-238	-208	-325	-124	-282	0	-15	-411	-540
1962	-184	-248	-275	-149	-187	-439	-157	-294	0	1	1	-455
1963	-195	0	-321	-292	-264	-463	-169	-143	-355	-391	-263	-416
1964	-162	-235	-361	-370	-334	-414	-143	-280	-136	-378	-482	-434
1965	-183	-229	-21	0	-254	-460	0	-216	-372	-641	-748	-429
1966	-154	-239	-311	-440	-409	-470	0	-280	-300	-540	-393	-636
1967	-123	-229	-294	-264	-253	-470	-316	0	-284	-431	-470	-470
1968	-468	-480	-471	-432	-162	-179	-273	-218	-300	-445	-450	-429
1969	-133	-244	-312	-429	-89	-444	-310	-221	-470	-470	-470	-470
1970	-470	-471	-252	-471	-467	-318	-11	-216	-443	-463	-469	-458
1971	-238	-303	-374	-465	-470	-470	-169	-221	-24	-329	-345	-361
1972	-121	-188	-254	-470	-136	-178	-236	-219	-300	-504	-429	-432
1973	-138	-240	-152	-425	-408	-462	-165	-218	-391	-415	-450	-397
1974	-190	-249	-321	-492	-418	-337	-154	-222	-470	-485	-469	-470
1975	-253	-331	-400	-470	-470	-460	-169	-222	-385	-406	-440	-445
1976	-173	-249	-470	-470	-177	-168	-133	-284	-300	-533	-539	-401
1977	-159	-226	-249	311	-276	-300	0	-5	-117	-768	-78	-153
1978	-85	-87	-122	-82	-38	-308	-209	-170	-212	176	-346	0
1979	-232	-327	-247	-470	0	-327	-157	-219	-324	-429	-374	-408
1980	344	-225	-470	-774	-271	-423	-165	-222	-488	-459	-470	-470
1981	-270	-331	-400	-470	-470	-470	-58	0	-207	-475	-470	-444
1982	-135	-218	-25	-259	-463	-437	-316	-233	-470	-470	-470	-470
1983	-284	-357	-448	-470	-408	-434	-315	-238	-468	-469	-470	-469
1984	-469	-455	-451	-470	-355	-296	0	-219	-389	-464	-499	-447
1985	-176	-254	-326	-470	-343	-178	-118	-184	-300	-440	-472	-456
1986	-179	-669	-307	-408	-373	421	-316	-78	-426	-413	-209	-470
1987	-202	-563	-210	-590	-433	-470	-268	-254	0	-344	-330	-377
1988	-146	-193	-265	-227	-193	-300	-133	-186	0	244	-380	-274
1989	-175	41	-100	-117	-86	-334	-91	-293	0	3	-427	-470
1990	-283	-196	-516	-217	-181	-300	0	-151	-126	336	494	11
1991	185	-771	58	147	-78	-313	0	-143	-37	-179	-493	-210
1992	-43	-282	-138	66	-47	-248	0	-197	-79	-425	-428	-299
1993	-132	-123	-153	-130	-139	-432	0	0	0	0	-627	-435
1994	-172	-246	-313	-431	-390	-300	-94	-243	-134	-353	-428	-446
1995	21	-115	-279	-216	3	-467	-2	-187	-1	0	0	0
1996	-451	-472	-252	-466	-464	-750	-169	-228	-422	-487	-487	-469
1997	-247	-326	-395	-465	-470	-419	-159	-218	-417	-483	-469	-465
1998	-117	-281	-350	-470	-450	-349	-231	-237	-470	-470	-470	-470
1999	-467	-467	-452	-466	-351	-322	-147	-223	-416	-445	-478	-468
2000	-201	-278	-349	-470	-422	-470	-165	-220	-347	-575	-214	-412
2001	-183	-236	-301	-299	-267	-460	-143	0	0	-377	-534	-394
2002	-45	-389	-293	-240	0	-425	-143	-246	-156	0	-369	-373
2003	-158	-210	-277	0	-290	-437	-165	-228	-133	-136	-407	-408
Average	**-188**	**-259**	**-295**	**-314**	**-264**	**-368**	**-147**	**-178**	**-235**	**-319**	**-393**	**-398**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-4:
CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(B) Alternative 2

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	-470	-395	-449	-163	-114	-431	-165	0	-354	-393	-426	-431
1923	-120	-241	-309	-373	-300	-470	-157	-29	-327	-377	-510	-412
1924	-164	-230	-298	-253	-214	-300	-133	-172	-194	-113	-148	-151
1925	21	-331	-124	-95	-112	-300	0	0	0	61	-407	-422
1926	-215	-249	-296	-241	-210	-300	0	-218	0	-169	-569	-333
1927	-129	-174	0	0	0	-189	-169	0	0	-429	-288	-527
1928	-151	-268	-340	-468	-427	-469	-62	-219	-300	-329	-240	-389
1929	-155	-235	-291	-246	-213	-385	-133	-173	-194	-375	-441	-246
1930	57	-19	-134	0	0	-405	-244	-250	0	-4	-351	-429
1931	-149	-210	-279	-218	-175	-300	0	-155	-169	-209	-85	-214
1932	-110	-125	-128	0	-47	-338	0	0	0	0	-1016	-257
1933	-130	-165	-143	631	251	-350	-223	-178	-203	-61	-258	-211
1934	30	-254	714	-2830	569	-381	0	-200	0	581	11	-316
1935	-212	100	-277	-120	-114	-350	0	0	-359	3	2	-426
1936	-205	-257	-312	-275	-242	0	-156	-326	-1	-238	-292	-479
1937	-150	-239	-326	-260	-456	-510	-324	-45	-119	-393	-386	-434
1938	-185	-242	-134	-664	-460	-452	-316	-221	-470	-482	-502	-470
1939	-427	-470	-470	-470	-89	-377	-10	-289	-300	-140	-548	-433
1940	-176	-188	-326	-191	-160	-439	-165	0	0	-614	-262	-424
1941	-164	-219	-305	-306	-289	-11	-272	-248	-427	-453	-481	-470
1942	-214	-306	-376	-426	-446	-470	-169	-232	-440	-472	-481	-469
1943	-222	-302	-465	-436	-314	-364	-316	-557	-451	-493	-493	-470
1944	-233	184	-882	-470	-439	-470	-143	-5	0	-376	-512	-431
1945	-325	-211	-276	-240	-428	63	-147	-14	-300	-509	-105	-452
1946	-188	-254	-261	-455	-888	-470	-157	-219	-313	-388	-433	-395
1947	-148	-258	-284	-254	-223	-454	-143	0	0	-8	-421	-554
1948	-150	-234	-482	-364	-300	-411	-157	0	0	0	-380	-827
1949	-122	-238	-340	-119	-199	-432	-268	-289	0	0	-404	-455
1950	-194	-265	-295	-248	0	-429	-157	0	0	0	-378	-370
1951	-147	-219	-242	-415	-480	-305	-85	-220	-398	-459	-457	-463
1952	-356	-265	-336	-453	-17	-469	-261	-222	-391	-429	-461	-470
1953	-466	-477	-356	-443	-167	-179	0	-215	-385	-273	-458	-437
1954	-180	-247	-320	-454	-422	-470	-165	-117	-300	-417	-261	-450
1955	-280	-234	-303	-104	-313	-470	-143	-252	0	-523	-527	-521
1956	-147	-196	-267	-245	0	-105	-169	-225	-446	-493	-495	-467
1957	-225	-302	-332	-573	-470	-470	-320	-62	-211	-368	-391	-431
1958	-157	-227	-292	-384	-279	-330	-352	-249	-470	-482	-470	-470
1959	-287	-473	-470	-348	-470	-470	-26	-118	-300	-180	-391	-439
1960	-161	-221	-357	-299	-249	-401	-143	-272	0	0	-334	-407
1961	-146	-242	-654	-238	-208	-325	-143	-281	0	15	-383	-570
1962	-197	-259	-274	-148	-187	-438	0	-294	0	1	1	-459
1963	-195	0	0	-292	-264	-464	-169	-144	-356	-390	-264	-415
1964	-163	-235	-487	-369	-333	-414	-143	-280	-142	-378	-481	-366
1965	-235	-229	-21	0	-250	-459	0	-216	-373	-652	-755	-430
1966	-127	-240	-237	-440	-409	-470	0	-280	-300	-540	-393	-641
1967	-134	-229	-293	-264	-253	-470	-316	0	-121	-431	-470	-470
1968	-468	-480	-470	-432	-162	-179	-314	-218	-300	-433	-431	-429
1969	-125	-247	-312	-429	0	-302	-316	-221	-470	-470	-470	-470
1970	-470	-471	-252	-438	-467	-318	-12	-216	-443	-464	-469	-458
1971	-236	-303	-275	-465	-470	-470	-169	-221	-24	-329	-345	-361
1972	-132	-187	-254	-3168	-211	-450	-294	-219	-302	-24	-101	-497
1973	-131	-242	-1	-423	-406	-462	-165	-218	-393	-414	-449	-400
1974	-207	-250	-323	-360	-418	-335	-169	-222	-470	-475	-470	-470
1975	-253	-330	-399	-470	-470	-460	-169	-222	-385	-405	-440	-444
1976	-173	-249	-470	-470	-177	-168	-133	-284	-300	-533	-540	-399
1977	-161	-226	-296	-214	-246	-300	0	-69	-115	-463	-122	-151
1978	-86	-101	-122	-82	-38	-300	-215	-157	-211	152	-370	0
1979	-233	-327	-231	-470	0	-185	-157	-219	-324	-430	-375	-408
1980	381	-225	-470	-812	-271	-423	-165	-222	-488	-459	-470	-470
1981	-271	-331	-400	-470	-470	-470	-58	0	-162	-475	-470	-444
1982	-135	-218	0	-259	-470	-441	-316	-233	-470	-470	-470	-470
1983	-284	-357	-448	-421	-398	-409	-316	-239	-470	-470	-470	-470
1984	-470	-456	-452	-469	-354	-296	0	-217	-389	-465	-500	-448
1985	-176	-254	-326	-470	-343	-178	-143	-185	-300	-417	-449	-457
1986	-180	-671	-307	-408	-394	423	-316	0	-332	-447	-270	-470
1987	-202	-500	-240	-565	-433	-470	-268	-254	0	-344	-330	-381
1988	-150	-193	-264	-227	-193	-300	-133	-186	0	240	-381	-274
1989	-170	31	-74	-117	-86	-334	0	-293	0	3	-427	-524
1990	-256	-196	-493	-218	-182	-300	0	-150	-126	240	430	-26
1991	147	-698	58	73	-69	-309	0	-143	-43	-193	-514	-208
1992	-39	-288	-139	71	-47	-247	0	-195	-79	-595	-500	-307
1993	-163	-38	-211	-130	-139	-432	0	0	0	-6	-637	-432
1994	-186	-245	-312	-430	-390	-300	-127	-243	-134	-354	-404	-444
1995	21	-120	-279	-216	3	-436	-2	-212	-1	0	0	0
1996	-451	-472	-252	-443	-425	-750	-169	-228	-422	-487	-487	-469
1997	-248	-326	-395	-443	-470	-419	-159	-218	-417	-483	-469	-465
1998	-117	-281	-350	-470	-450	-141	-231	-237	-470	-470	-470	-470
1999	-467	-467	-452	-466	-351	-322	-157	-244	-416	-436	-469	-467
2000	-201	-278	-349	-470	-422	-435	-165	-220	-347	-577	-214	-412
2001	-184	-236	-301	-299	-267	-460	-143	0	0	-232	-536	-392
2002	13	-468	-293	-240	0	-425	-143	-245	-156	0	-379	-372
2003	-152	-210	-277	0	-168	-437	-165	-170	-134	-175	-408	-412
Average	**-186**	**-262**	**-287**	**-370**	**-252**	**-355**	**-145**	**-174**	**-222**	**-289**	**-386**	**-409**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-4: CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(C) Alternative 3

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	1	0	0	0	0	0	0	0	0	-11	0
1923	111	0	0	701	0	0	0	0	0	0	4	1
1924	58	56	-7	0	0	0	0	0	0	80	59	89
1925	127	-193	2	0	0	0	0	0	0	-79	-24	540
1926	306	-24	8	0	0	0	0	0	-1	-172	-131	290
1927	-31	-1	0	0	0	0	0	0	0	1	1	81
1928	-122	0	0	0	0	0	0	0	0	-88	0	228
1929	-14	94	-141	0	0	0	0	23	0	-14	-53	20
1930	113	139	0	0	0	0	0	23	0	-74	-111	-73
1931	-53	-52	-31	0	0	0	0	0	0	-30	68	196
1932	151	209	0	0	0	0	0	0	0	0	-688	17
1933	-6	-5	-4	740	1050	0	0	0	0	-167	357	45
1934	36	159	304	201	1076	0	0	0	1	0	-73	11
1935	45	114	286	0	0	0	0	0	0	-3	-2	356
1936	46	6	105	0	2	0	0	-216	0	-76	-60	127
1937	-104	40	285	0	-101	2877	474	281	0	-587	-372	38
1938	18	0	0	859	-10	-332	35	38	0	-12	114	0
1939	53	31	16	0	0	0	0	0	0	0	0	27
1940	16	32	-1	0	0	0	0	0	0	-20	1	1
1941	-92	29	0	0	0	0	160	0	-46	-44	-11	0
1942	0	0	0	0	0	0	0	0	0	-12	-11	0
1943	0	0	0	0	-147	11	3	-26	0	24	24	0
1944	-22	521	-390	0	0	0	0	-1	0	30	7	-76
1945	-152	0	0	0	41	401	0	0	0	-33	289	-1
1946	35	0	0	0	-407	0	0	0	0	-35	0	37
1947	84	333	0	27	0	0	0	0	0	-278	-197	227
1948	215	234	387	0	0	0	0	0	0	-1	-1	52
1949	88	44	-11	128	0	0	0	23	0	0	0	192
1950	-55	-3	65	0	0	0	0	0	0	0	0	41
1951	-3	0	0	134	-93	224	0	0	0	20	0	37
1952	-90	0	0	0	0	0	0	0	0	0	0	0
1953	-2	-2	0	0	0	0	0	0	0	0	-22	0
1954	-5	0	0	0	0	0	0	0	0	-187	0	290
1955	-27	0	0	2781	0	0	0	23	2	121	92	914
1956	350	130	-1	1	-6	1	0	0	0	17	19	-4
1957	-2	-2	-163	0	0	0	0	0	0	150	1	258
1958	1	0	0	1214	0	-2	-44	0	0	-12	0	0
1959	0	-2	4	0	0	0	0	0	0	20	0	226
1960	23	16	597	0	0	0	0	0	0	0	0	814
1961	78	-86	0	0	0	0	0	15	0	-386	-331	250
1962	-179	-113	234	105	0	0	0	0	0	1	1	-145
1963	1	0	0	0	0	0	0	0	0	108	0	117
1964	0	0	-2	0	0	0	0	63	0	0	0	-231
1965	105	0	0	0	0	0	0	0	0	29	52	0
1966	22	0	0	0	0	0	0	0	0	45	0	27
1967	9	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	-1	0	0	0	0	0	0	0	149	25
1969	15	47	4086	1505	-1474	-2517	-101	24	0	169	26	0
1970	0	29	0	26	0	0	0	0	0	41	89	-5
1971	-15	0	0	0	0	0	0	0	0	0	0	0
1972	-49	6	0	0	0	0	0	0	0	39	98	0
1973	-17	0	0	0	0	0	0	0	0	1	-43	73
1974	25	0	0	-109	0	0	0	0	0	1	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	2	2	3
1977	-3	0	1255	826	-62	0	0	132	0	-604	86	0
1978	26	13	0	0	0	-5	-92	-222	-170	225	-296	0
1979	-353	-1	262	0	0	0	0	0	0	80	77	-2
1980	459	0	0	-429	0	0	0	0	71	-34	99	0
1981	102	39	0	0	0	0	0	0	0	48	39	1
1982	31	0	0	0	0	15	0	0	0	170	0	0
1983	0	0	0	0	-73	7	9	9	10	9	0	9
1984	9	8	4	0	60	745	0	0	0	10	10	17
1985	0	0	0	0	0	0	0	23	0	-29	-29	4
1986	1	22	0	0	25	-17	453	26	0	-164	262	0
1987	-5	-501	81	-32	0	0	0	0	0	-44	-9	728
1988	11	136	179	0	1	0	0	20	0	52	-40	233
1989	-13	153	160	0	0	0	0	0	0	0	0	692
1990	-272	120	-580	0	0	0	0	0	0	516	679	529
1991	214	-478	173	23	-11	0	0	0	0	18	-301	0
1992	62	-135	-1	166	0	0	0	0	0	88	-87	19
1993	-49	102	-4	0	0	0	0	0	0	-6	-453	0
1994	-11	81	-15	0	0	0	0	0	0	-4	-30	-11
1995	157	117	0	0	2	105	-1	-27	0	0	0	0
1996	0	-2	0	0	0	113	0	0	49	-23	-23	0
1997	15	0	0	0	0	310	0	0	0	0	0	0
1998	10	287	0	0	0	0	141	0	0	0	0	0
1999	16	14	0	0	7	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	48	-15	-7
2001	116	80	29	0	0	0	0	0	0	0	62	306
2002	131	-122	0	0	0	0	0	0	0	0	85	298
2003	-19	0	0	0	-117	0	0	0	0	166	-1	28
Average	**21**	**21**	**87**	**108**	**-3**	**24**	**13**	**3**	**-1**	**-11**	**-7**	**97**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-4:
CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(D) Alternative 4

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	0	0	0	0	0	-4	0
1923	-13	0	0	0	0	0	0	0	0	0	-6	0
1924	0	0	-4	0	0	0	0	0	0	3	2	95
1925	124	-178	0	0	0	0	0	0	0	58	-21	-16
1926	-50	-16	-3	0	0	0	0	0	0	4	86	8
1927	-5	0	0	0	0	0	0	0	0	0	0	-101
1928	184	0	0	0	0	0	0	0	0	-9	0	29
1929	6	-1	-7	0	0	0	0	0	0	-1	-52	16
1930	110	138	0	0	0	0	0	0	0	-8	-3	-27
1931	-16	-13	-8	0	0	0	0	0	0	-10	90	0
1932	-12	22	0	0	0	0	0	0	0	0	-8	0
1933	-4	-3	0	51	0	0	0	0	0	11	-2	1
1934	0	0	0	-1	0	0	0	0	0	0	77	-5
1935	-13	25	-64	0	0	0	0	0	0	-1	0	25
1936	-17	0	-1	0	0	0	0	0	0	-1	-1	-46
1937	43	-1	-19	0	6	1	0	0	0	2	-113	0
1938	0	0	0	116	0	0	0	0	0	-31	-3	0
1939	35	0	0	0	0	0	0	0	0	0	0	-6
1940	-6	2	-4	0	0	0	0	0	0	-4	0	0
1941	8	-11	0	0	0	0	-4	0	0	0	-144	0
1942	0	0	0	0	0	0	0	0	0	22	-4	0
1943	0	0	0	-1	0	0	0	1	0	4	4	0
1944	-2	3	3	0	0	0	0	0	0	0	0	0
1945	1	0	0	0	1	0	0	0	0	0	-62	0
1946	-94	0	0	0	171	0	0	0	0	5	0	0
1947	0	-3	0	0	0	0	0	0	0	-2	-1	-3
1948	-2	3	-30	0	0	0	0	0	0	0	0	-4
1949	0	0	3	-1	0	0	0	0	0	0	0	-7
1950	-404	1	22	0	0	0	0	0	0	4	3	69
1951	3	1	0	66	455	224	0	0	0	-112	-3	0
1952	-170	-1	0	0	2	-1	-1	0	0	0	0	0
1953	-7	-7	0	0	0	0	0	0	0	3	-10	4
1954	-2	1	0	0	0	0	0	0	0	-25	-1	7
1955	-13	0	0	2781	0	0	0	1	2	216	204	358
1956	350	59	-1	1	-6	1	0	0	0	24	25	-4
1957	-2	-1	-235	0	0	0	0	0	0	-14	1	0
1958	1	0	0	1214	0	-1	-497	0	0	-4	0	0
1959	0	-1	0	0	0	0	0	0	0	-21	0	0
1960	5	3	6	0	0	0	0	0	0	0	0	1
1961	2	0	0	0	0	0	0	0	0	-2	-2	-1
1962	-1	-1	26	-18	0	0	0	0	0	0	0	-2
1963	0	0	0	0	0	0	0	0	0	-199	0	2
1964	0	0	-18	0	0	0	0	-1	0	0	0	6
1965	-17	0	0	0	0	0	0	0	0	-1	-1	0
1966	2	0	0	0	0	0	0	0	0	-11	0	4
1967	-5	0	0	0	0	0	0	0	0	0	0	0
1968	-1	-1	-1	0	0	0	0	0	0	0	0	0
1969	-3	1	0	0	0	3	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	-9	0	-3
1971	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	-5	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	-7
1974	-5	0	0	12	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	3
1977	-3	0	1104	841	-369	0	0	0	0	-275	88	0
1978	-13	43	0	0	0	-1	-267	-51	0	86	0	0
1979	-194	-1	20	0	0	0	0	0	0	10	-194	0
1980	-10	0	0	19	216	0	0	0	0	1	0	0
1981	-5	0	0	0	0	0	0	0	0	-1	-1	-26
1982	-1	0	0	0	0	23	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	-3	-3	-3
1985	0	0	0	0	0	0	0	0	0	1	1	-3
1986	-2	4	0	0	3	-4	0	0	0	0	-60	0
1987	-4	66	-87	46	0	0	0	0	0	-3	-5	-10
1988	6	0	-2	0	0	0	0	0	0	28	14	3
1989	21	129	187	0	0	0	0	0	1	4	3	41
1990	-35	48	-110	0	0	0	0	0	0	185	451	105
1991	203	-453	173	12	-5	0	0	0	0	-18	-133	0
1992	27	-55	1	60	0	0	0	0	0	72	-19	9
1993	-9	14	0	0	0	0	0	0	0	-4	-3	-1
1994	-6	0	0	0	0	0	0	0	0	0	0	-1
1995	0	0	0	0	0	2	0	0	0	0	0	0
1996	0	-197	0	0	0	3	0	0	-4	2	2	0
1997	-10	0	0	0	0	0	0	0	0	-9	0	0
1998	17	0	0	0	0	0	8	0	0	0	0	0
1999	1	1	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	-7	1	-3
2001	0	0	0	0	0	0	0	0	0	0	-1	0
2002	3	-12	0	0	0	0	0	0	0	0	0	0
2003	-10	0	0	0	15	0	0	0	0	-2	0	4
Average	**0**	**-5**	**12**	**63**	**6**	**3**	**-9**	**-1**	**0**	**-1**	**2**	**6**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-5:
CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(A) Alternative 1

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	470	395	470	198	126	370	0	670	355	342	426	458
1923	175	402	372	459	301	472	0	646	296	371	404	459
1924	170	236	299	257	268	305	0	180	193	89	135	154
1925	-12	27	77	-12	55	300	-162	634	470	470	189	408
1926	171	237	300	275	223	300	-57	207	470	437	217	314
1927	137	273	470	470	470	349	0	670	470	270	324	458
1928	309	223	480	470	436	470	0	670	170	383	250	395
1929	165	231	295	249	279	468	0	304	197	28	238	240
1930	-40	16	59	470	470	370	0	485	470	449	295	386
1931	145	200	274	239	82	304	-181	19	-56	-8	199	214
1932	102	140	181	470	-144	489	0	524	470	470	470	286
1933	130	165	144	151	31	313	-181	184	204	379	226	212
1934	-77	-15	-21	26	470	468	0	202	387	423	190	319
1935	122	24	18	-13	131	470	0	465	287	470	429	394
1936	192	255	303	217	259	570	-34	654	470	470	296	457
1937	190	249	311	293	249	370	0	670	470	229	375	424
1938	182	381	470	433	463	469	0	670	348	482	481	478
1939	474	472	470	476	114	478	0	289	300	374	326	441
1940	173	247	315	216	179	470	-121	470	470	470	89	413
1941	174	239	425	313	302	570	0	670	320	467	481	478
1942	323	347	413	461	454	472	0	670	355	477	481	478
1943	332	342	468	466	323	451	0	670	347	482	481	458
1944	237	323	399	471	459	472	0	670	470	185	308	392
1945	150	311	326	250	474	570	-115	651	297	242	334	458
1946	171	274	592	461	419	473	0	670	324	371	386	383
1947	151	222	433	256	216	472	0	597	470	381	382	429
1948	165	239	302	263	201	404	-136	452	470	470	218	411
1949	144	218	286	170	107	464	0	458	470	470	375	418
1950	171	235	298	153	470	470	-136	470	470	190	206	459
1951	123	233	575	468	240	366	0	670	340	432	467	451
1952	179	418	393	456	470	369	0	670	297	478	481	478
1953	475	470	417	447	179	339	0	670	343	290	433	478
1954	179	316	358	459	430	370	0	663	272	398	272	449
1955	167	474	398	470	222	470	0	470	470	242	335	358
1956	134	193	313	249	460	547	0	670	297	395	481	477
1957	335	301	405	469	469	470	0	670	297	260	402	399
1958	295	381	350	325	338	467	0	661	371	482	480	478
1959	397	472	470	353	470	470	0	670	127	303	402	469
1960	153	216	284	290	197	470	0	471	470	372	287	467
1961	150	343	167	116	102	379	-162	433	470	378	338	409
1962	166	148	165	113	101	396	-136	274	470	470	366	463
1963	350	470	448	278	273	470	0	580	358	398	276	458
1964	318	295	386	374	349	470	0	467	470	356	394	412
1965	166	306	67	422	105	403	0	670	349	405	423	458
1966	164	325	430	443	418	470	0	460	491	386	404	473
1967	166	360	347	248	64	370	0	653	470	359	481	478
1968	475	471	470	446	170	431	0	670	317	407	438	421
1969	176	250	373	443	442	364	0	670	297	457	481	478
1970	473	471	314	463	471	359	0	670	344	479	481	458
1971	233	394	477	470	472	472	0	670	69	344	395	432
1972	178	188	300	477	169	433	0	670	257	406	439	495
1973	177	372	350	247	415	471	0	670	260	422	455	455
1974	381	328	379	469	432	471	0	670	347	481	481	478
1975	363	373	436	475	462	469	0	670	349	416	480	478
1976	472	391	471	477	207	267	0	316	336	289	221	260
1977	-15	83	160	175	106	309	-181	-67	-7	128	141	153
1978	86	128	158	85	44	470	0	455	470	470	470	391
1979	236	487	409	477	470	631	0	670	179	382	397	447
1980	335	300	270	565	214	472	0	670	342	481	481	458
1981	268	344	480	474	470	370	0	643	470	187	327	427
1982	161	332	470	7	470	467	0	670	357	482	481	476
1983	392	393	468	464	429	463	0	670	364	482	480	477
1984	474	466	465	471	368	332	0	670	345	423	456	458
1985	346	266	435	470	357	398	0	639	126	399	403	455
1986	179	254	396	431	406	471	-104	653	297	278	358	459
1987	202	287	363	471	454	473	0	258	470	134	325	383
1988	145	200	275	286	193	300	0	307	470	405	234	274
1989	113	32	24	-5	-59	376	-162	293	470	398	384	472
1990	185	145	182	147	190	440	-181	151	102	2	169	223
1991	96	129	115	86	47	403	0	143	16	180	191	210
1992	105	150	141	98	66	325	0	197	-60	8	457	286
1993	126	170	157	151	187	470	0	408	470	470	470	373
1994	185	261	327	477	456	480	0	243	133	343	277	243
1995	-18	93	309	215	470	270	-114	634	470	470	533	658
1996	500	472	312	465	466	472	0	670	352	482	481	478
1997	246	410	428	462	472	474	0	670	345	451	480	456
1998	237	390	403	482	467	520	0	670	297	350	481	478
1999	475	470	464	469	373	473	0	670	347	449	481	478
2000	207	339	355	477	441	518	0	670	306	398	269	412
2001	195	256	318	361	297	473	0	653	470	244	334	446
2002	185	249	416	256	470	470	0	496	259	379	365	364
2003	158	186	228	470	212	470	-121	637	161	93	297	461
Average	**218**	**282**	**333**	**336**	**299**	**432**	**-28**	**531**	**334**	**359**	**366**	**412**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-5: CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(B) Alternative 2

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	470	395	470	419	114	370	0	670	355	342	426	458
1923	175	473	473	540	301	471	0	646	296	371	404	459
1924	168	234	298	256	344	304	0	178	190	86	132	151
1925	-15	25	323	101	44	300	-76	634	470	470	189	408
1926	171	236	300	476	239	300	-57	207	470	437	218	310
1927	134	473	470	470	470	470	0	670	470	470	324	458
1928	475	383	568	470	471	470	0	670	170	383	250	395
1929	169	235	297	250	347	476	0	485	198	28	241	246
1930	-36	19	350	470	470	370	0	488	470	449	295	389
1931	146	201	274	436	60	341	-181	22	-55	138	199	214
1932	102	140	470	470	-70	490	0	524	470	470	470	286
1933	130	165	144	351	4	344	-181	306	203	379	226	211
1934	-77	-15	-21	280	470	470	0	200	387	423	187	316
1935	121	23	17	237	114	470	0	465	288	470	429	394
1936	194	257	304	380	307	570	-34	654	470	470	533	457
1937	193	252	313	476	293	370	0	670	470	403	373	422
1938	185	484	470	459	463	469	0	670	348	482	481	478
1939	474	472	470	477	228	480	0	289	300	374	326	444
1940	176	249	317	454	172	470	-121	470	470	470	382	413
1941	182	246	476	471	391	570	0	670	320	467	481	478
1942	474	471	470	461	470	472	0	670	355	477	481	478
1943	474	469	468	466	446	471	0	670	347	482	481	458
1944	242	327	400	473	473	475	0	670	470	194	308	393
1945	154	480	478	474	476	570	-115	651	297	242	334	458
1946	175	362	678	470	419	473	0	670	324	371	386	383
1947	155	225	474	258	333	473	0	601	470	381	382	429
1948	165	238	302	351	201	403	-136	452	470	470	461	411
1949	158	228	292	173	109	471	0	473	470	470	373	431
1950	179	242	302	357	470	470	-136	470	470	470	313	459
1951	153	356	684	468	355	374	0	670	340	432	467	451
1952	199	481	477	475	470	369	0	670	297	478	481	478
1953	475	470	464	469	302	470	0	670	343	290	442	478
1954	179	469	477	474	470	370	0	665	272	398	272	449
1955	183	487	483	470	220	470	0	487	470	280	335	358
1956	147	203	476	470	460	570	0	670	297	395	481	477
1957	474	301	475	472	473	470	0	670	297	259	401	398
1958	476	549	468	465	413	472	0	661	371	482	480	478
1959	475	472	473	472	473	470	0	670	127	303	402	475
1960	161	221	288	293	300	473	0	480	470	372	290	474
1961	154	419	169	118	222	381	-162	432	470	378	337	412
1962	166	148	165	112	219	470	0	274	470	470	366	472
1963	472	470	470	672	395	470	0	580	358	398	276	458
1964	411	476	513	468	463	470	0	473	470	356	394	423
1965	177	478	446	422	315	403	0	670	349	406	420	458
1966	173	478	546	469	471	470	0	460	491	386	403	486
1967	175	480	475	455	95	370	0	653	470	359	481	478
1968	475	471	470	466	289	472	0	670	324	407	438	421
1969	184	256	485	484	442	517	0	670	297	457	481	478
1970	473	471	466	463	471	393	0	670	344	479	481	458
1971	238	477	515	470	472	472	0	670	347	344	395	478
1972	246	188	480	453	459	474	0	670	154	404	436	499
1973	178	490	350	331	467	471	0	670	262	424	458	455
1974	482	358	585	469	472	471	0	670	347	481	481	478
1975	474	472	468	478	459	469	0	670	349	417	480	478
1976	472	472	471	480	311	483	0	323	344	294	226	267
1977	-13	85	161	168	99	335	-181	-2	115	126	139	151
1978	85	127	470	154	38	470	0	455	470	470	470	391
1979	237	488	410	477	470	631	0	670	179	382	397	447
1980	442	490	270	651	331	472	0	670	342	481	481	458
1981	269	344	480	474	470	370	0	643	470	187	327	428
1982	162	491	470	277	593	467	0	670	357	482	481	476
1983	472	465	468	464	466	465	0	670	364	482	480	477
1984	474	466	465	471	471	365	0	670	345	423	456	458
1985	483	421	522	470	471	470	0	640	126	399	403	456
1986	180	255	485	489	486	471	-104	653	470	278	358	459
1987	202	287	365	472	473	476	0	260	470	133	325	388
1988	148	202	277	475	192	300	0	470	470	405	234	274
1989	113	32	24	-5	-59	376	-105	293	470	398	384	472
1990	184	145	181	344	187	470	-181	150	101	193	206	221
1991	95	128	115	86	47	470	0	143	53	179	190	208
1992	105	150	141	98	174	470	0	195	-61	8	456	284
1993	124	168	151	402	181	470	0	408	470	470	470	373
1994	185	261	327	477	471	480	0	243	133	343	277	242
1995	-18	105	466	439	470	270	-114	634	470	470	533	658
1996	500	472	464	465	466	472	0	670	352	482	481	478
1997	246	468	464	462	472	474	0	670	345	451	480	456
1998	237	495	485	482	478	520	0	670	297	350	481	478
1999	475	470	464	469	473	473	0	670	347	449	481	478
2000	207	469	354	477	480	570	0	670	306	398	269	412
2001	194	255	317	479	372	473	0	652	470	358	334	440
2002	181	245	479	478	470	470	0	497	470	379	365	364
2003	152	391	372	470	470	470	-121	637	296	93	297	459
Average	**240**	**329**	**392**	**408**	**345**	**449**	**-24**	**538**	**345**	**373**	**377**	**413**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-5:
CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(C) Alternative 3

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	104	0	152	-173	-51	11	8
1923	3	2	2	-13	1	2	0	213	-174	-6	11	7
1924	7	7	6	4	3	-38	0	8	-105	-120	-89	-89
1925	-119	-114	-100	-111	-65	-109	-162	-235	370	370	258	1
1926	9	7	6	5	0	-109	-57	-199	-433	337	86	15
1927	11	11	370	370	359	0	0	198	-174	-170	-3	8
1928	-2	4	-2	0	1	0	0	-149	180	12	11	8
1929	2	2	2	1	1	1	0	5	2	241	5	-20
1930	-160	-139	-128	370	370	-22	0	14	81	-170	-30	11
1931	7	5	4	-36	-121	-131	-181	-140	-226	-223	-213	-196
1932	-182	-157	-142	370	142	12	0	424	370	370	327	10
1933	6	5	4	-17	-123	-131	-181	-143	0	279	0	-45
1934	-188	-159	-147	-135	370	0	0	0	-455	323	3	17
1935	-17	-161	-148	-141	0	0	-136	-370	-71	370	329	0
1936	-8	-6	-20	-99	-11	470	-34	554	370	-91	-111	8
1937	-12	-9	-6	-3	-6	226	0	255	-173	-170	-58	8
1938	-21	-13	43	-11	-7	-1	0	144	-122	12	11	8
1939	4	2	0	-7	-7	-10	0	0	0	258	-64	-25
1940	-16	-12	-8	-5	-10	0	-121	370	-68	39	-174	-38
1941	-30	-22	-16	-4	-4	116	0	117	-150	12	11	8
1942	4	1	-12	3	0	2	0	133	-115	12	11	8
1943	4	-1	-2	-4	0	1	0	144	-123	12	11	8
1944	-26	-18	-10	-6	-6	-16	0	570	-58	-170	-39	-7
1945	-19	-17	-15	-14	-13	391	-115	150	-173	-170	-112	8
1946	-36	10	25	0	-102	96	0	168	-146	12	11	8
1947	-26	-23	-14	-11	-31	-10	0	440	-433	281	0	-50
1948	-22	-17	-16	-132	-127	-82	-136	352	370	135	-174	-37
1949	-37	-25	-17	-68	-101	-16	0	-43	370	287	-5	-44
1950	-22	-17	-13	-125	370	0	-136	187	-173	-170	-171	8
1951	-56	58	-5	-2	0	3	0	151	-130	12	11	8
1952	-38	-33	-19	-36	292	-101	0	143	-173	8	11	8
1953	5	0	-6	-1	3	0	0	150	-127	12	11	8
1954	5	1	-37	-8	0	49	0	-149	-28	207	11	8
1955	-31	-26	-40	177	-183	0	0	-46	-433	449	46	6
1956	-13	-9	-5	-15	360	-59	0	140	-173	-74	11	7
1957	4	2	-16	-5	-6	0	0	344	-173	-114	11	8
1958	-35	41	-2	-5	-16	-13	0	137	-99	12	10	8
1959	5	2	-14	-5	-15	-92	0	400	-421	171	11	-25
1960	-24	-16	-10	-16	-82	-7	0	-29	-433	272	0	-30
1961	-15	-13	-127	-128	-125	-100	-162	0	-433	278	0	-48
1962	-19	-98	-141	-137	-104	-86	-136	309	-71	370	266	-14
1963	-9	370	370	474	-1	0	0	131	-112	12	11	8
1964	-1	-1	4	-2	3	0	0	-2	67	-22	0	4
1965	4	3	2	254	-201	-67	0	-149	178	12	10	8
1966	-2	-1	3	-1	1	0	0	178	-153	12	11	-1
1967	0	0	0	-24	142	91	0	125	-175	-111	11	8
1968	5	1	0	-4	0	2	0	168	-146	12	9	8
1969	-11	-8	-8	-9	231	-106	0	145	-173	-13	11	8
1970	3	1	-4	-7	1	3	0	149	-126	12	11	8
1971	-19	-15	29	0	-93	88	0	144	-123	12	11	8
1972	5	0	-9	-9	19	4	0	168	-146	12	11	-26
1973	-9	-13	226	-184	-3	1	0	154	-131	12	11	8
1974	-29	29	-3	-1	2	1	0	143	-123	11	11	8
1975	4	2	-2	-15	14	-1	0	143	-121	12	10	8
1976	2	2	1	-8	-5	-10	0	-38	-30	-157	-249	-230
1977	-198	-165	-152	-147	-161	-144	-181	-222	-255	-265	-114	0
1978	0	0	0	-20	0	0	0	355	370	370	370	291
1979	355	8	6	3	370	374	0	167	-146	12	11	0
1980	9	9	31	-45	-4	2	0	149	-128	11	11	8
1981	8	6	4	2	0	215	0	193	-173	-170	-22	10
1982	6	7	223	-257	0	-3	0	132	-113	12	11	6
1983	2	-5	-2	-6	-4	-5	0	126	-106	12	10	7
1984	4	-4	-5	1	1	3	0	148	-125	12	11	8
1985	-7	6	-1	0	1	0	0	196	-174	12	11	-4
1986	-1	-1	-1	-1	-1	371	-104	239	-173	-170	-112	7
1987	5	2	-8	-4	-4	-11	0	-169	-433	266	0	-24
1988	-13	-10	-7	-5	-127	-144	0	0	-455	305	0	-9
1989	-23	-152	-142	-131	-161	-100	-162	-199	370	298	0	-10
1990	-7	-108	-135	-129	0	0	-181	0	-280	-214	-240	-173
1991	0	0	0	0	0	0	0	0	-28	0	0	0
1992	0	0	0	0	0	0	0	0	27	8	-34	0
1993	0	0	0	0	0	0	0	308	370	370	370	27
1994	17	18	12	6	1	9	0	0	0	0	-87	-140
1995	-156	-140	-118	-75	370	205	-114	534	370	370	433	22
1996	5	2	-6	-5	-4	2	0	137	-118	12	11	8
1997	4	-2	-6	-8	2	4	0	147	-125	12	10	8
1998	22	15	9	7	5	123	0	128	-173	-120	11	8
1999	5	0	-6	-1	3	3	0	142	-123	12	11	8
2000	5	1	3	3	5	23	0	151	-164	12	10	8
2001	14	10	8	5	6	2	0	548	-433	131	-35	20
2002	14	12	6	6	-332	0	0	26	0	279	0	0
2003	19	-78	-97	370	106	0	-121	110	-174	-171	-111	-13
Average	**-13**	**-14**	**-7**	**0**	**15**	**16**	**-29**	**118**	**-96**	**57**	**8**	**-7**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-5: CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, SEVERE FISHERY RESTRICTIONS

(D) Alternative 4

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	0	0	0	0	14	4	3
1923	2	2	2	-7	1	1	0	0	0	13	4	3
1924	4	4	4	3	2	3	0	4	-4	-126	-95	-95
1925	-124	-117	-104	-114	-69	0	-112	-26	0	0	0	1
1926	6	5	4	3	0	0	-19	0	0	0	0	7
1927	5	5	0	0	0	0	0	0	0	0	171	51
1928	5	45	203	202	200	101	0	0	10	4	4	3
1929	4	3	2	1	1	2	0	6	2	0	7	-16
1930	-158	-138	-127	0	0	0	0	16	0	0	0	17
1931	9	7	5	-35	-120	-130	-181	-109	0	0	0	0
1932	0	0	0	0	0	9	0	0	0	0	0	9
1933	4	3	2	-18	-26	0	0	0	0	0	0	-1
1934	0	0	0	0	0	0	0	0	0	0	0	5
1935	-5	0	0	0	0	0	0	0	-71	0	0	0
1936	0	0	68	0	0	0	0	0	0	0	63	44
1937	1	1	1	0	1	0	0	0	0	0	116	172
1938	-2	-2	0	194	234	116	0	0	51	31	4	3
1939	1	1	0	1	1	1	0	0	0	0	0	7
1940	6	5	3	2	3	0	-121	-200	0	0	0	6
1941	-7	-5	-4	-1	-1	0	0	0	23	182	143	3
1942	1	0	-1	-2	0	1	0	0	8	4	4	3
1943	2	0	-1	-2	0	0	0	0	10	4	4	3
1944	-2	-1	-1	0	0	-1	0	0	0	0	0	0
1945	0	0	0	0	0	0	-115	-19	0	0	62	57
1946	-3	10	54	0	1	1	0	0	10	4	4	3
1947	1	1	0	0	-23	0	0	0	0	0	0	7
1948	5	4	-4	-118	-97	-65	-136	-200	0	0	0	0
1949	-3	-2	-1	-61	-91	-1	0	-2	0	0	0	-3
1950	-2	-1	-4	-117	0	0	0	0	0	0	2	66
1951	-3	58	214	208	202	98	0	0	43	86	4	3
1952	13	11	7	5	0	0	0	0	-26	0	4	3
1953	2	0	-2	0	1	0	0	0	10	4	4	3
1954	2	0	4	2	0	-1	0	0	-28	37	4	3
1955	14	12	10	0	-40	0	0	10	0	5	4	3
1956	11	8	5	6	0	0	0	0	0	-18	4	3
1957	1	1	0	0	0	0	0	0	0	13	4	3
1958	-3	5	-1	-2	-2	-2	0	0	9	4	4	3
1959	2	1	-3	-1	-3	0	0	0	0	21	4	-5
1960	-5	-3	-2	-11	-79	-2	0	-5	0	0	0	-2
1961	-1	0	-120	-122	-119	-92	-162	0	0	0	0	-2
1962	-1	-84	-131	-17	0	0	0	-20	0	0	0	-1
1963	0	0	0	202	214	0	0	0	61	182	184	91
1964	10	8	43	37	1	0	0	4	0	11	0	14
1965	14	11	7	0	0	-39	0	0	9	4	4	3
1966	9	7	-16	0	0	0	0	0	12	4	4	11
1967	8	7	4	-18	0	0	0	0	0	2	4	3
1968	2	0	0	-1	0	1	0	0	10	4	3	3
1969	3	3	2	3	0	0	0	0	0	0	4	3
1970	1	0	-1	-3	0	1	0	0	10	4	4	3
1971	-4	-2	4	0	1	1	0	0	9	4	4	3
1972	2	0	-1	-1	2	2	0	0	10	4	4	0
1973	0	1	0	-2	-1	0	0	0	10	4	4	3
1974	-4	4	-1	-1	1	0	0	0	9	4	4	3
1975	1	1	-1	-1	1	0	0	0	10	4	4	3
1976	1	1	0	-1	-1	-1	0	-2	-1	-130	-226	-202
1977	-189	-160	-26	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	1
1979	193	0	0	0	0	61	0	0	28	182	184	0
1980	17	16	0	181	107	1	0	0	10	4	4	3
1981	16	11	8	3	0	0	0	0	0	0	-7	26
1982	14	15	0	-64	0	-1	0	0	9	4	4	2
1983	1	-2	-1	-2	-2	-2	0	0	9	4	4	3
1984	2	-2	-2	0	0	1	0	0	10	4	4	3
1985	-2	1	0	0	0	0	0	0	0	15	4	2
1986	2	2	1	2	2	-57	-104	-17	0	0	62	121
1987	4	1	-5	-2	-3	-7	0	-7	0	0	0	-10
1988	-6	-4	-3	-2	0	0	0	0	0	0	0	-3
1989	-20	-149	-140	-127	-149	-98	-162	0	0	0	0	-2
1990	-2	-50	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	1	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	63	188
1996	193	197	209	137	-1	1	0	0	9	4	4	3
1997	1	-1	-2	-3	1	1	0	0	10	4	4	3
1998	10	7	4	3	2	0	0	0	0	-19	4	3
1999	2	0	-2	0	1	1	0	0	9	4	4	3
2000	2	0	1	1	1	0	0	0	7	4	4	3
2001	4	3	3	1	2	1	0	0	0	0	0	11
2002	7	6	3	3	0	0	0	14	0	0	0	0
2003	10	-87	-103	0	0	0	-121	-33	0	0	67	-1
Average	**1**	**-4**	**1**	**4**	**2**	**-1**	**-15**	**-7**	**4**	**7**	**11**	**8**

NOTE: Values with a grey background indicate months of Delta excess conditions.

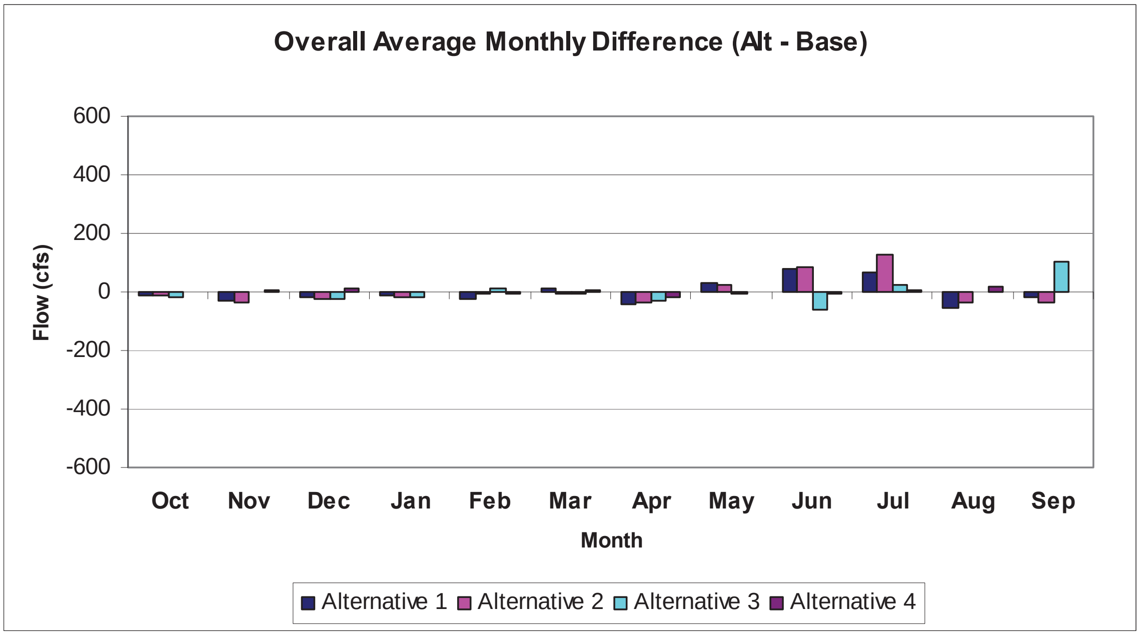

Figure C4-1: Changes in Average Monthly Sacramento River at Hood flow, 2005 LOD, Severe Fishery Restrictions

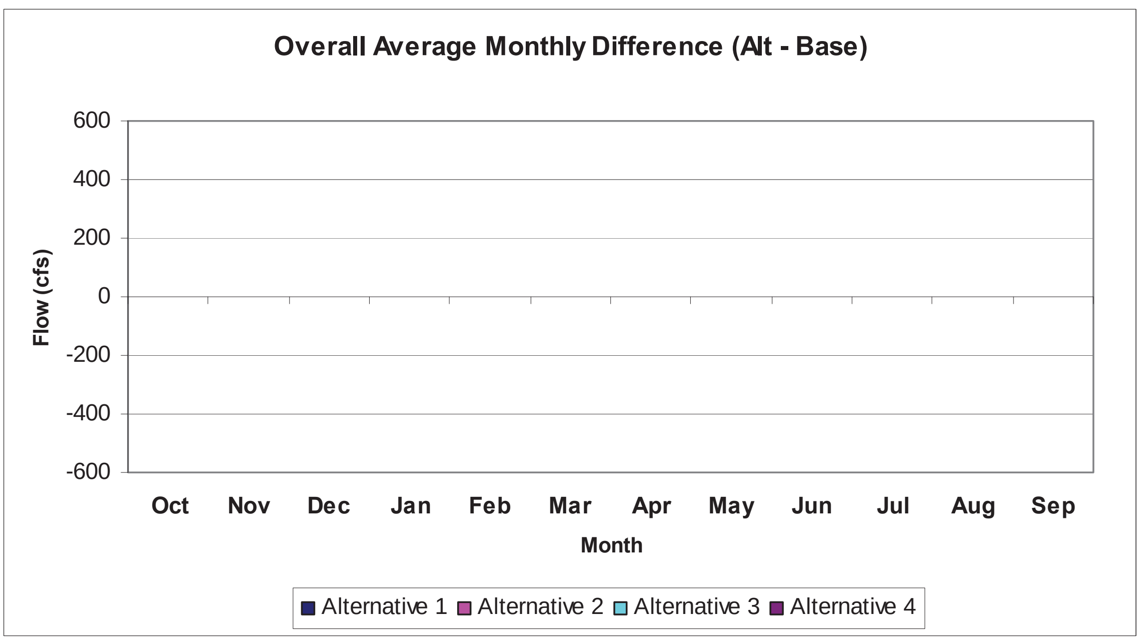

Figure C4-2: Changes in Average Monthly San Joaquin River at Vernalis Flow, 2005 LOD, Severe Fishery Restrictions

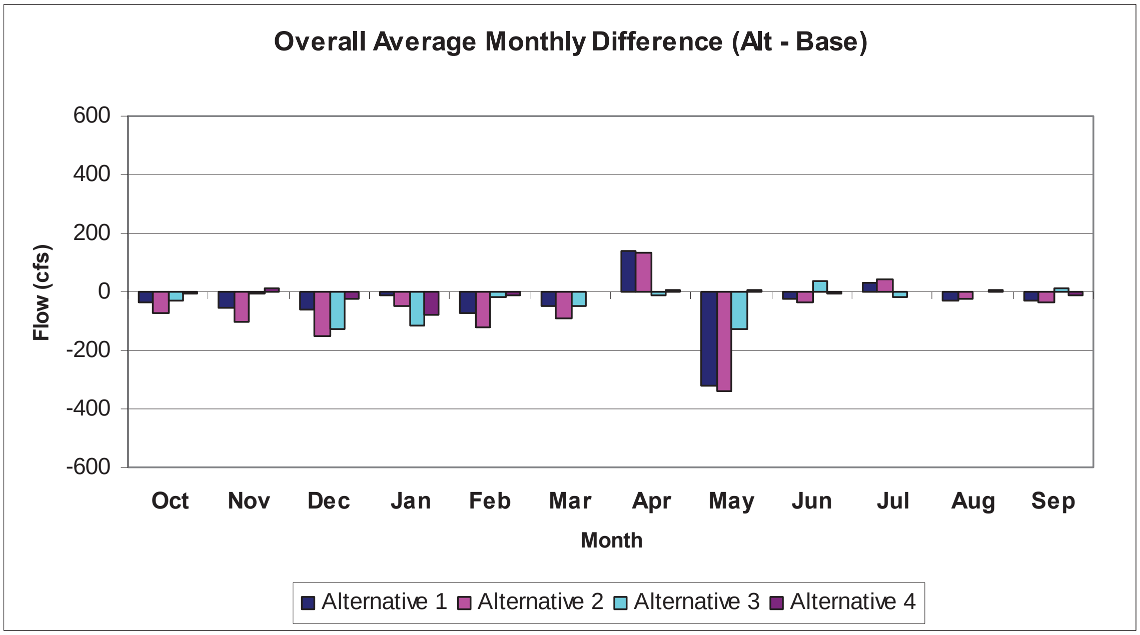

Figure C4-3: Changes in Average Monthly Delta Outflow, 2005 LOD, Severe Fishery Restrictions

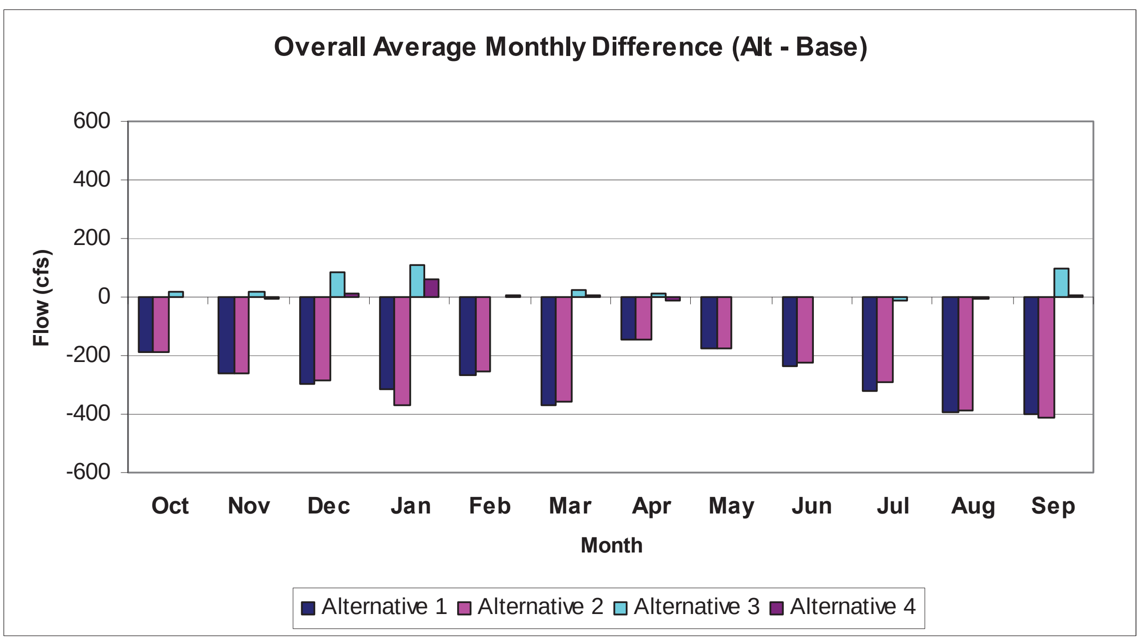

Figure C4-4: Changes in Average Monthly Banks + Jones Diversions, 2005 LOD, Severe Fishery Restrictions

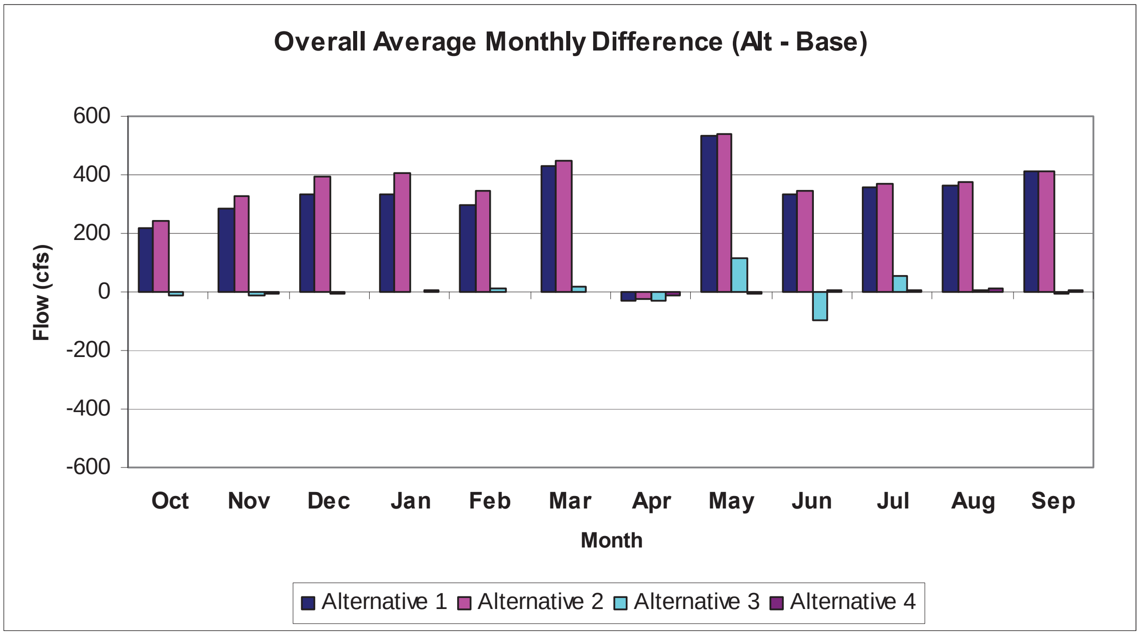

Figure C4-5: Changes in Average Monthly CCWD + LV Diversions, 2005 LOD, Severe Fishery Restrictions

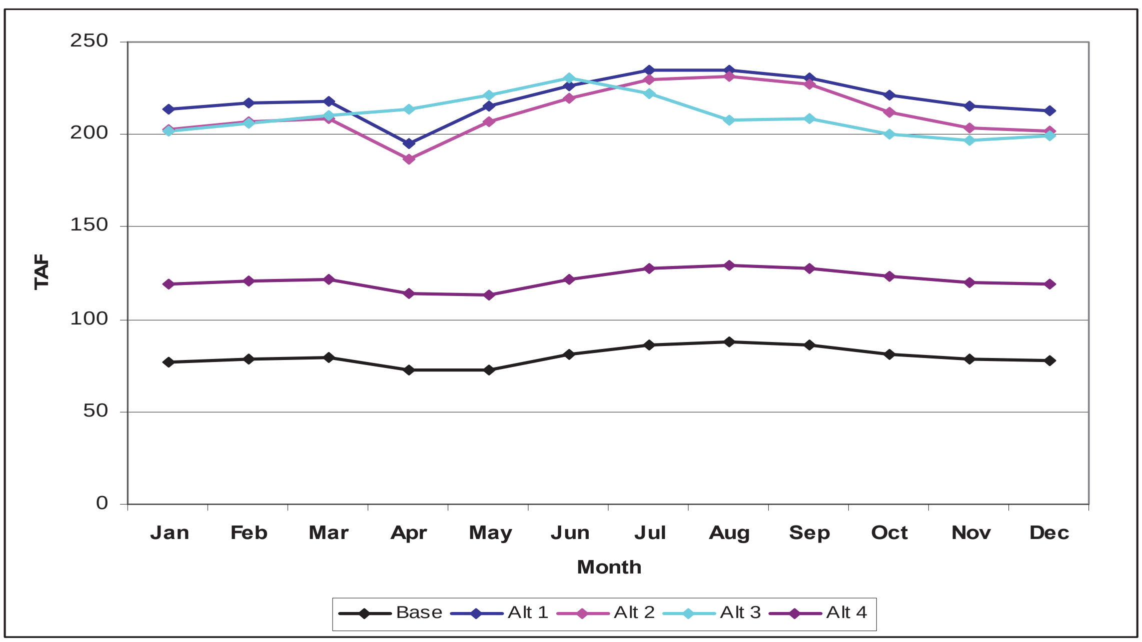

Figure C4-6: Average Los Vaqueros storage 2005 LOD, Severe Fishery Restrictions

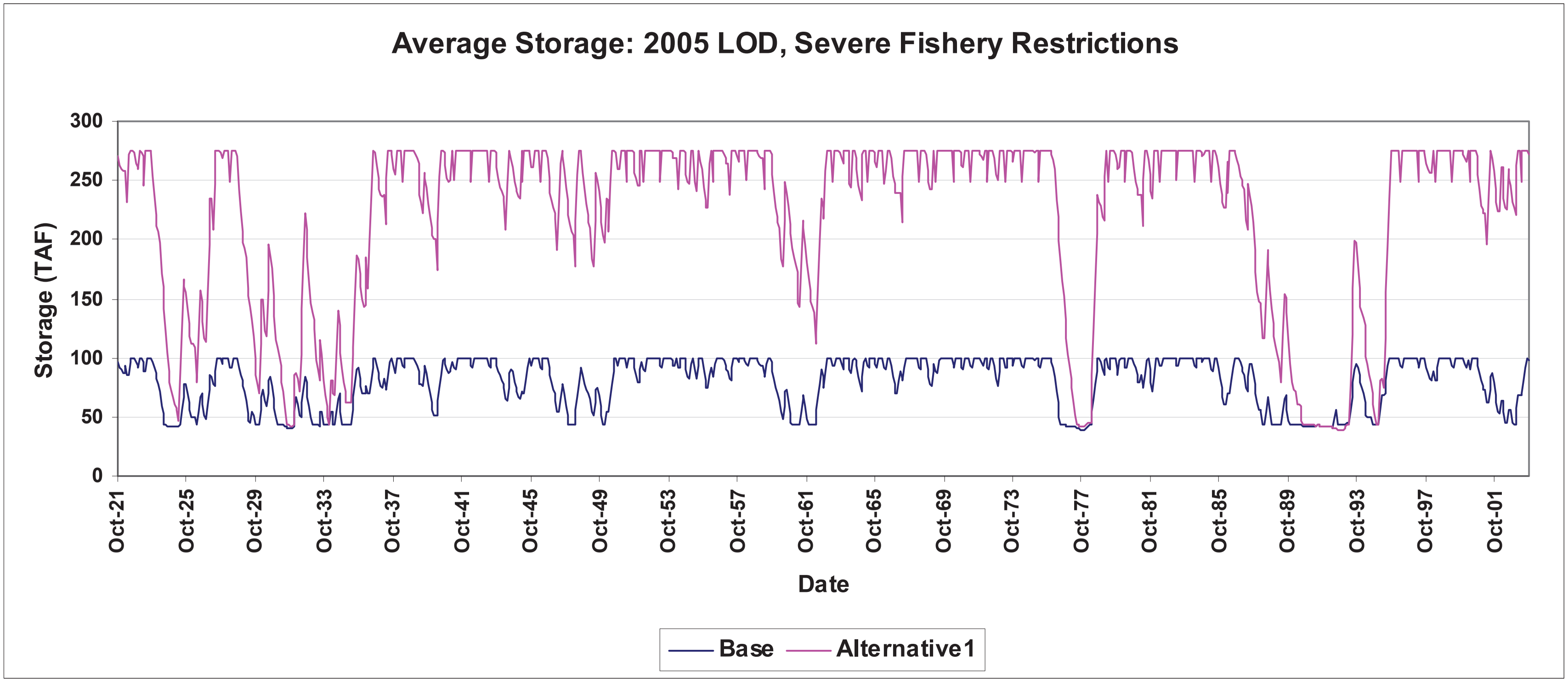

Figure C4-7: Timeseries of Alternative 1 and Base Los Vaqueros storage 2005 LOD, Severe Fishery Restrictions

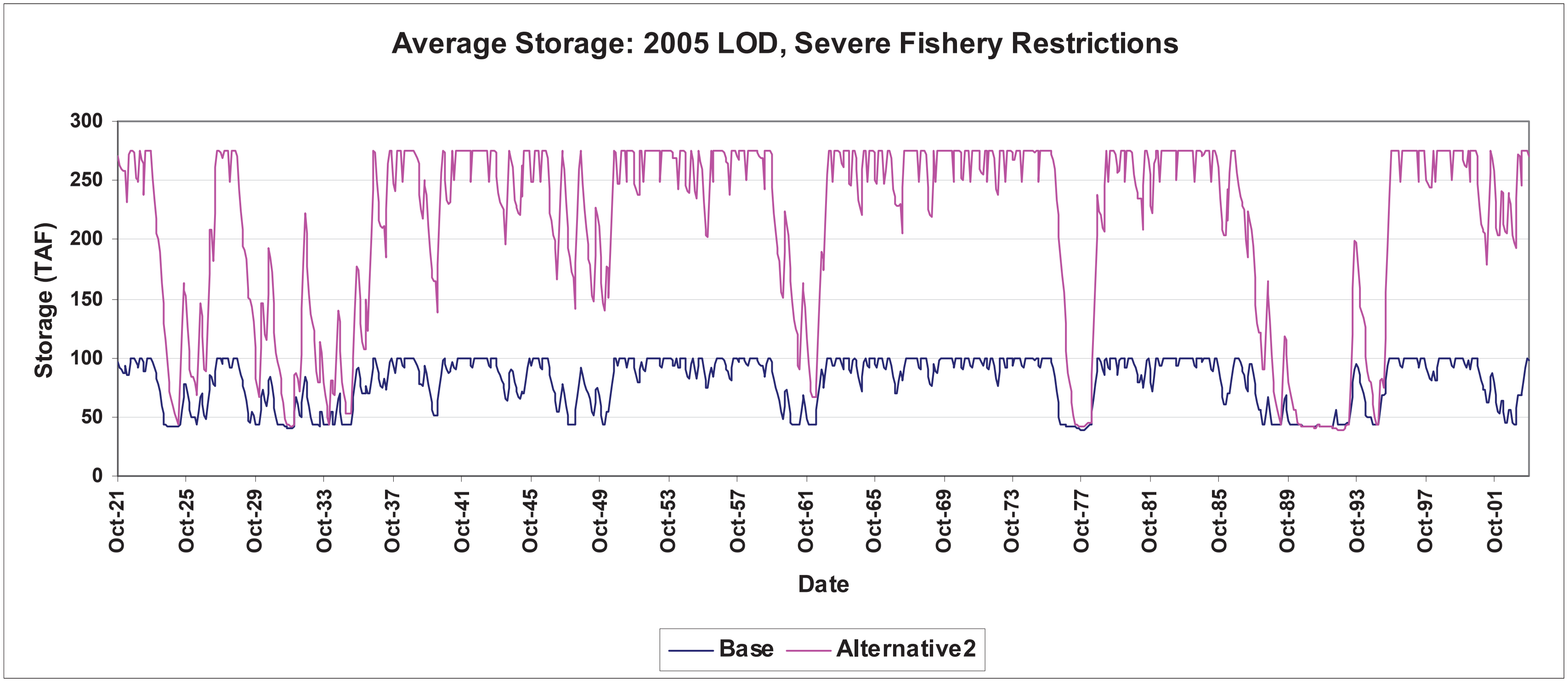

Figure C4-8: Timeseries of Alternative 2 and Base Los Vaqueros storage 2005 LOD, Severe Fishery Restrictions

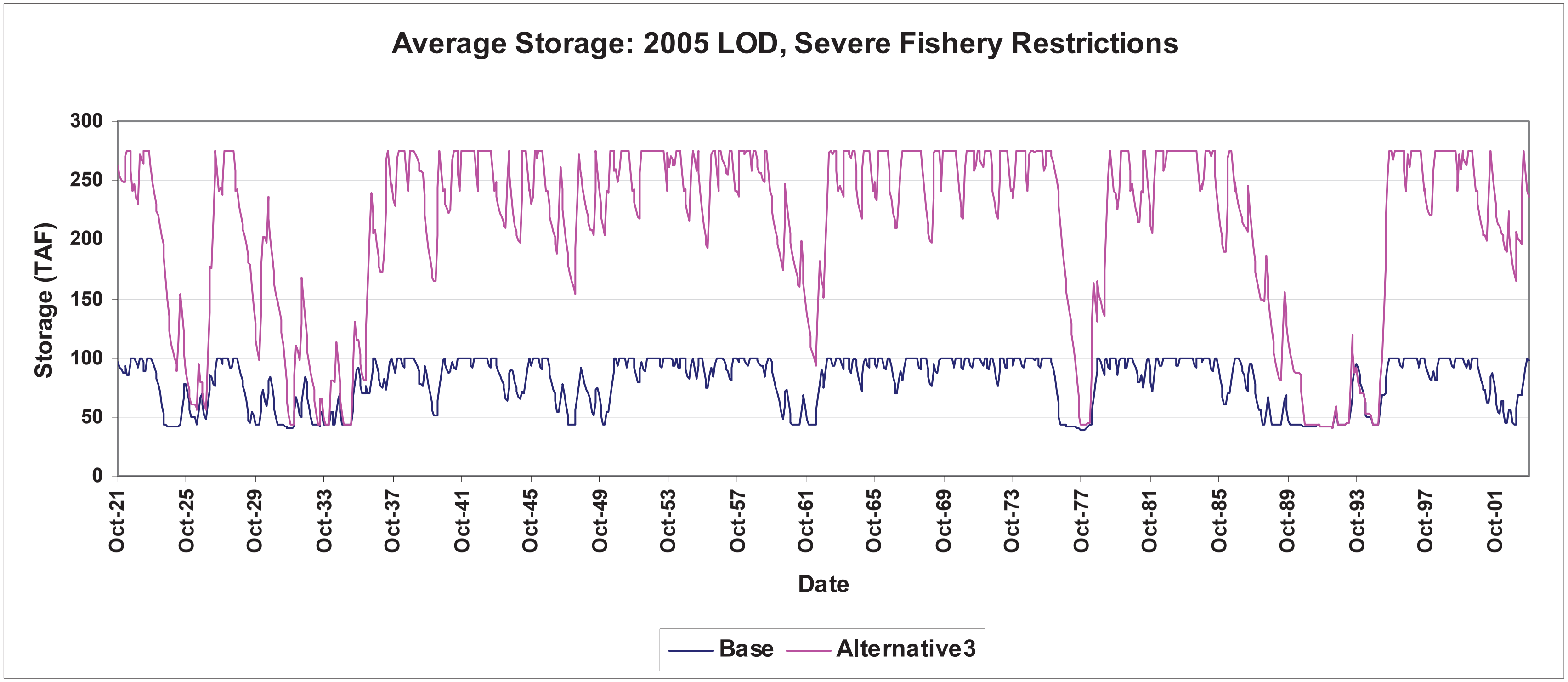

Figure C4-9: Timeseries of Alternative 3 and Base Los Vaqueros storage 2005 LOD, Severe Fishery Restrictions

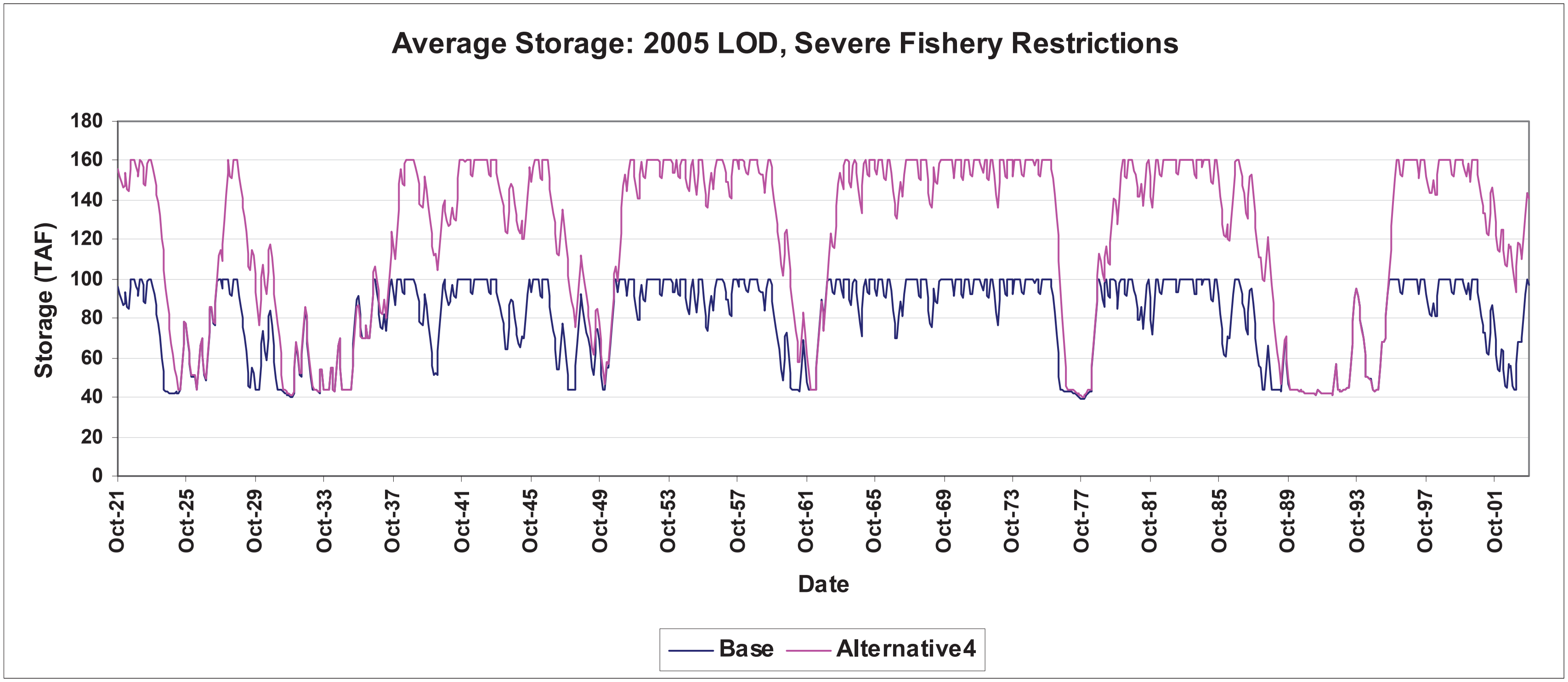

Figure C4-10: Timeseries of Alternative 4 and Base Los Vaqueros storage 2005 LOD, Severe Fishery Restrictions

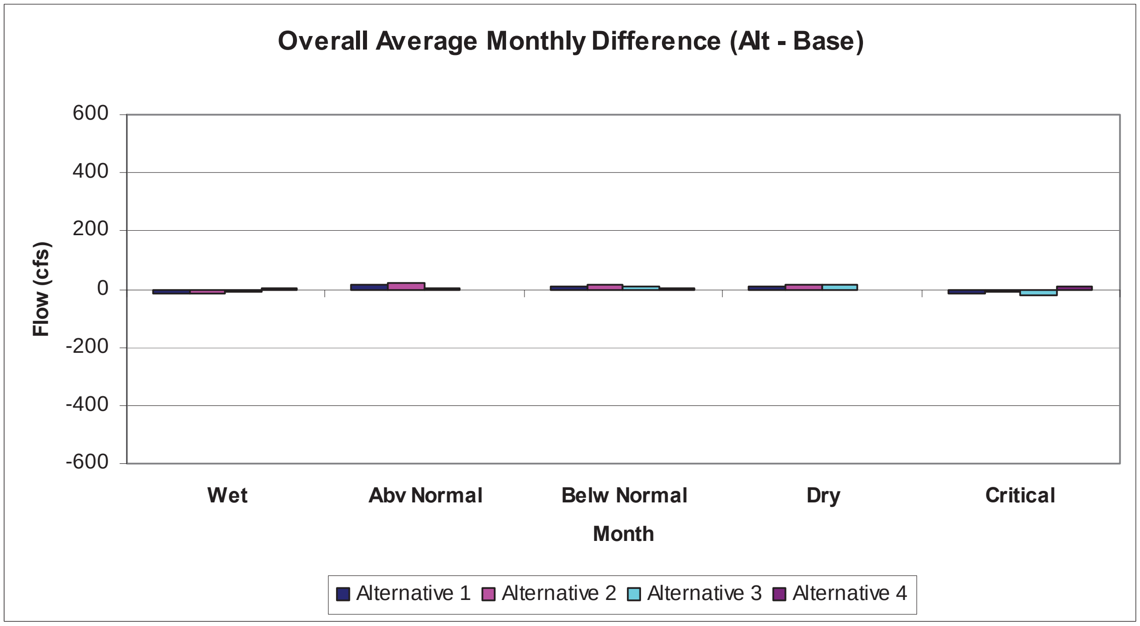

Figure C4-11: Changes in Sacramento River at Hood flow by water year type, 2005 LOD, Severe Fishery Restrictions

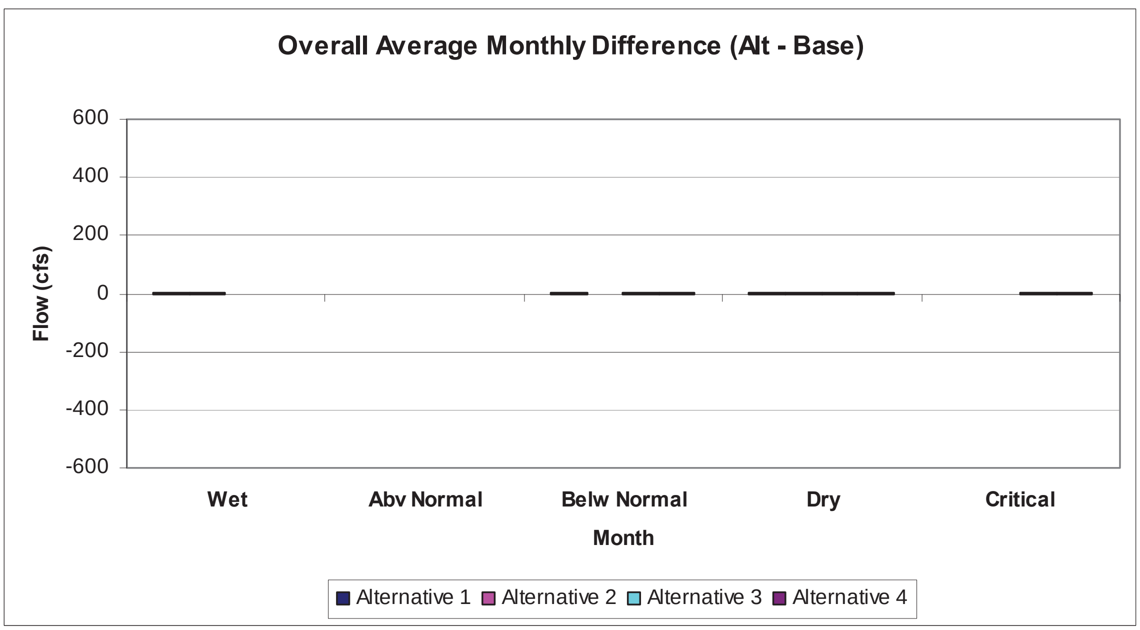

Figure C4-12: Changes in San Joaquin River at Vernalis flow by water year type, 2005 LOD, Severe Fishery Restrictions

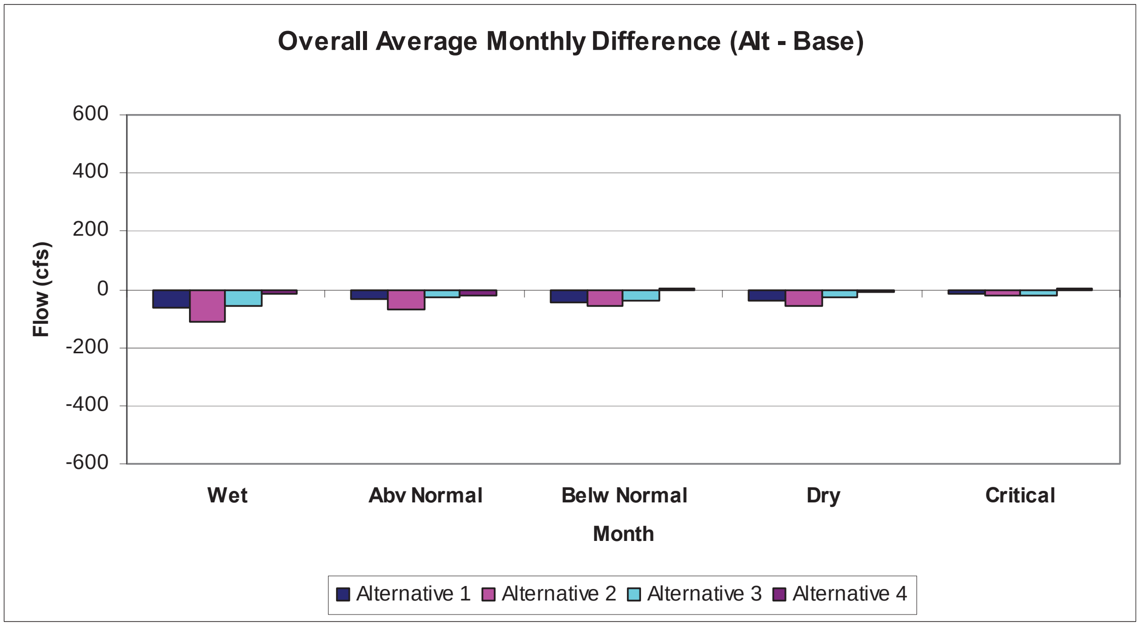

Figure C4-13: Changes in Delta Outflow by Year Type, 2005 LOD, Severe Fishery Restrictions

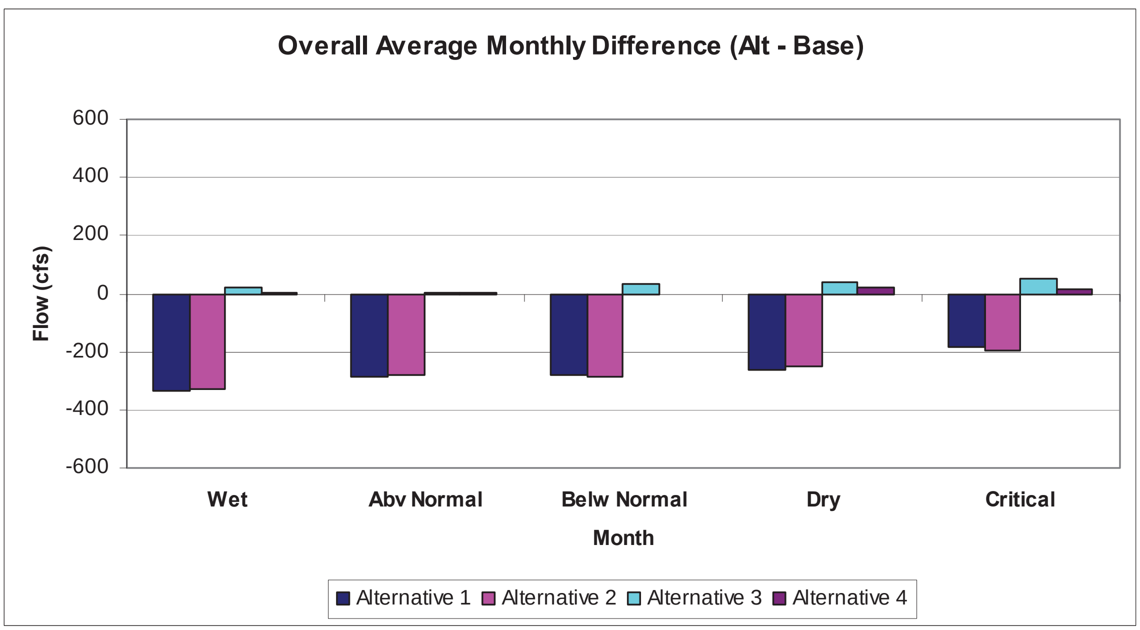

Figure C4-14: Changes in Banks + Jones Diversions by Year Type, 2005 LOD, Severe Fishery Restrictions

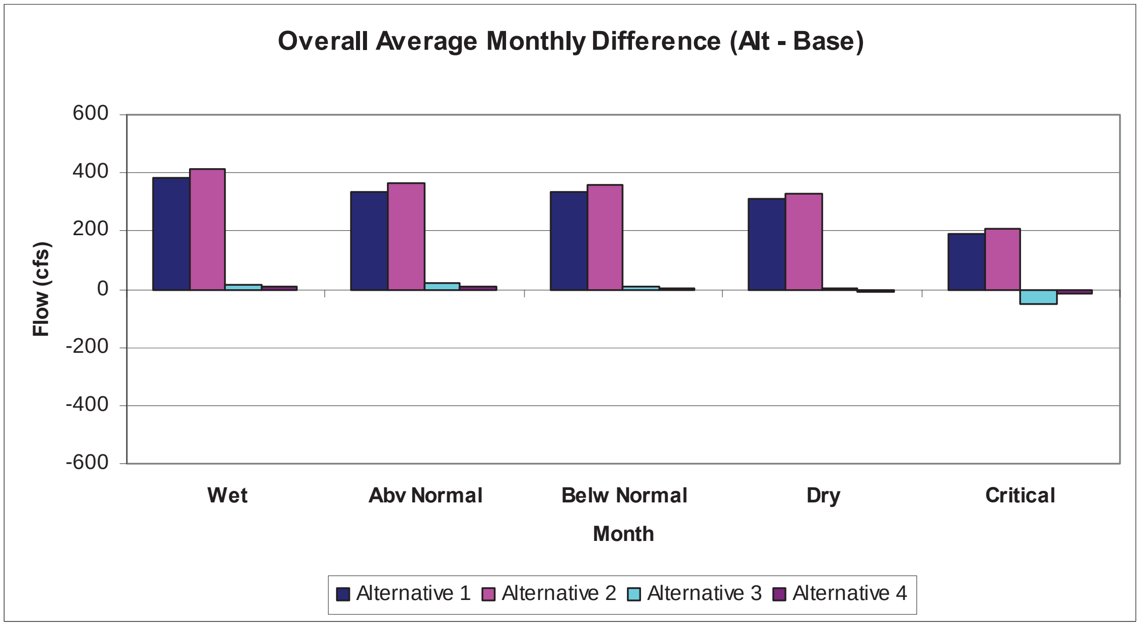

Figure C4-15: Changes in Project diversions by water year type, 2005 LOD, Severe Fishery Restrictions

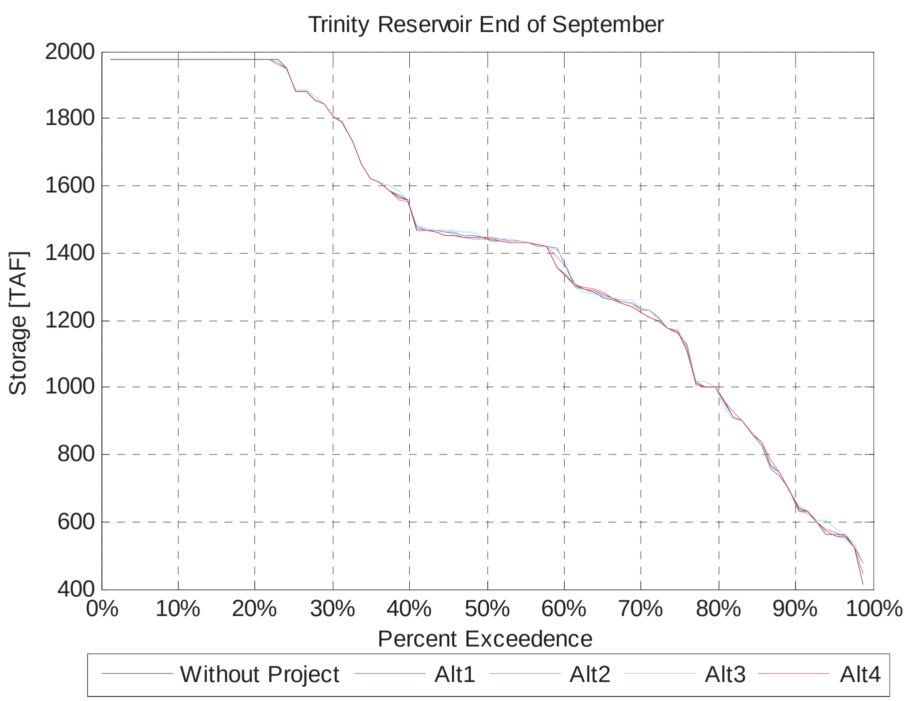

Figure C4-16: Trinity Reservoir end of September storage, 2005 LOD, Severe Fishery Restrictions

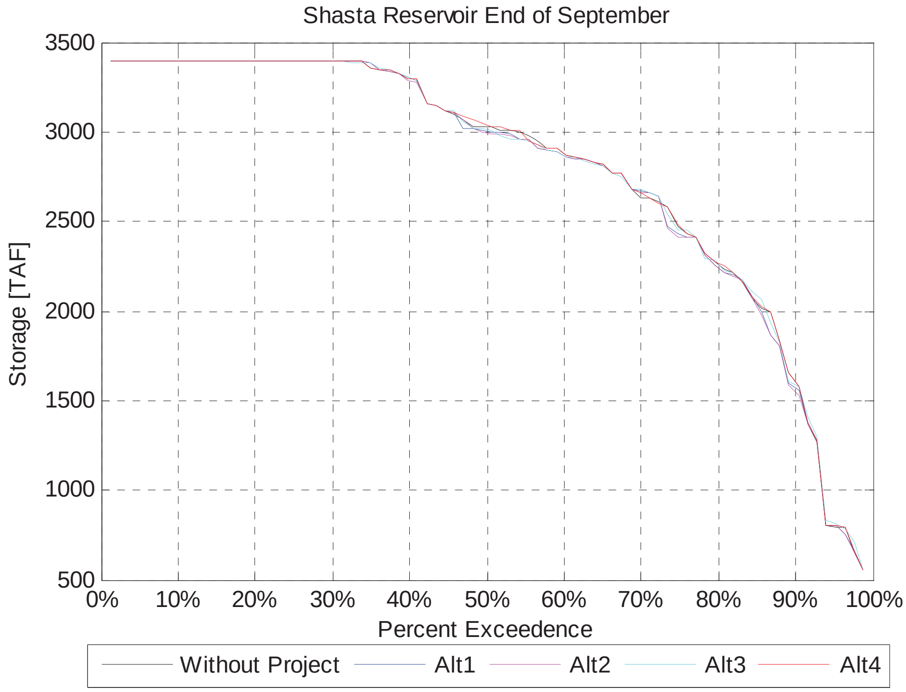

Figure C4-17: Shasta Reservoir end of September storage, 2005 LOD, Severe Fishery Restrictions

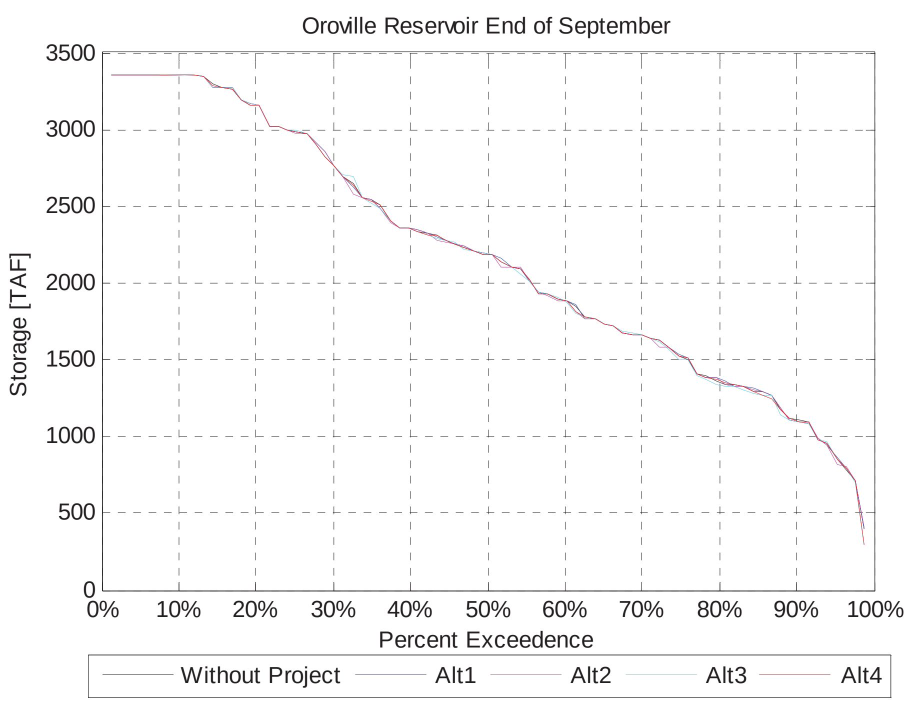

Figure C4-18: Oroville Reservoir end of September storage, 2005 LOD, Severe Fishery Restrictions

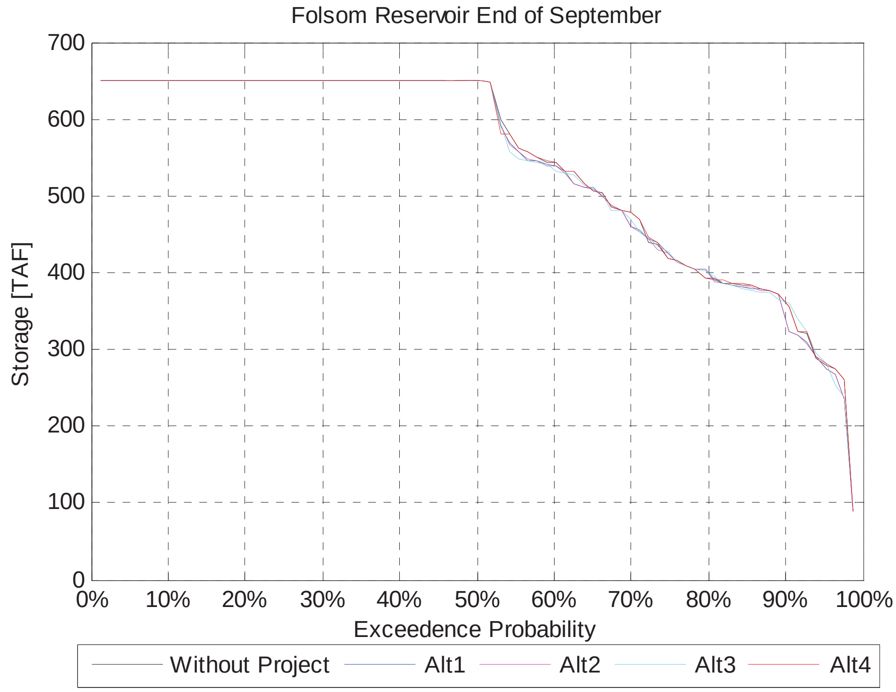

Figure C4-19: Folsom Reservoir end of September storage, 2005 LOD, Severe Fishery Restrictions

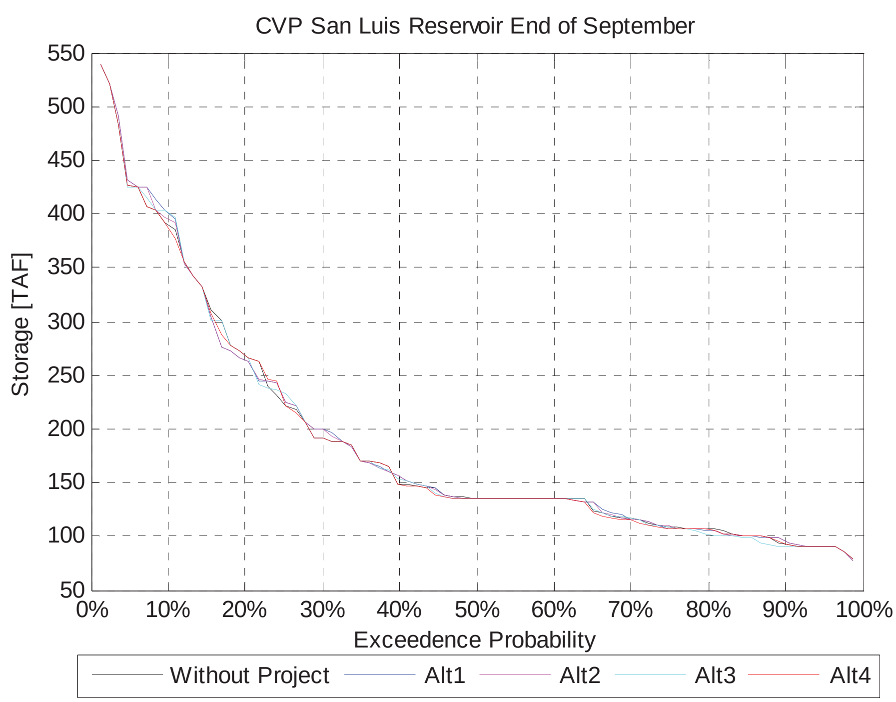

Figure C4-20: CVP San Luis Reservoir end of September storage, 2005 LOD, Severe Fishery Restrictions

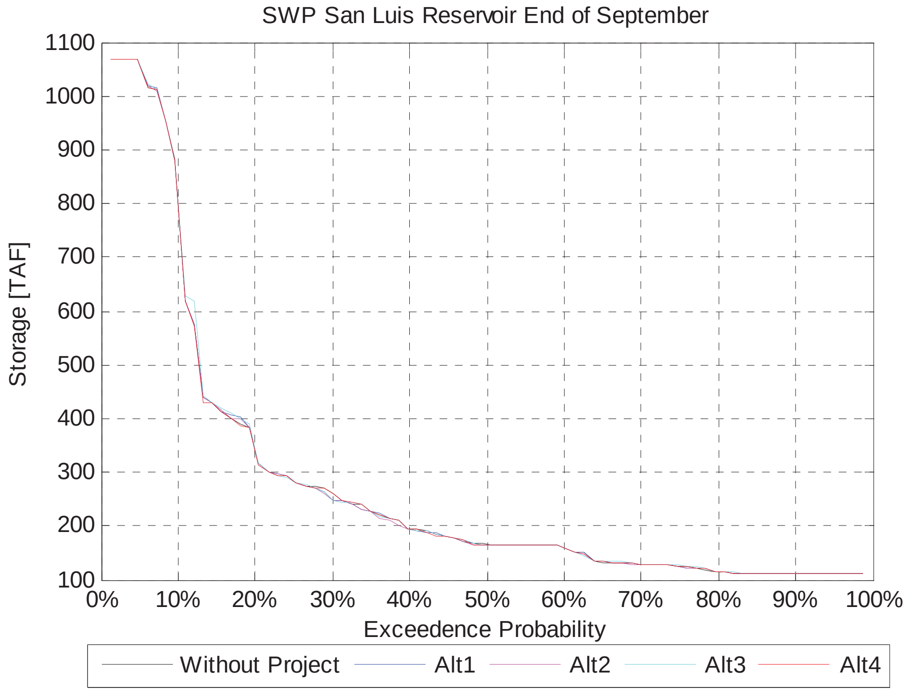

Figure C4-21: SWP San Luis Reservoir end of September storage, 2005 LOD, Severe Fishery Restrictions

2005 Level of Development, Moderate Fishery Restrictions

Model results for each project alternative are presented in **Table C4-6 (A-D)** as average values for full hydrologic study period (1921 to 2003) and a six-year dry period (1987 to 1992). These results include upstream and Delta flows and diversions (e.g. flow in Sacramento River and major tributaries, San Joaquin River flow, exports at Banks and Jones Pumping Plants, Net Delta Outflow, X2 position and QWEST), CVP and SWP south of Delta deliveries, CVP and SWP reservoir carry-over storages (at Folsom, Oroville, San Luis, Shasta and Trinity Reservoirs), and parameters specific to project alternative operations (CCWD and Los Vaqueros Reservoir (LV) diversions; additional south of Delta Environmental Water Supply deliveries; and Delta Supply Restoration deliveries to South Bay water agencies).

Table C4-7 and **Table C4-8** present the change in Delta channel flows and indices, upstream reservoir storages and local operation parameters for each project alternative as compared to the Existing Condition. Results are summarized in these tables as averages by water year type and by month, respectively.

Table C4-9 (A-D) presents the changes from the Existing Condition in monthly Banks and Jones export diversions for each project alternative, and **Table C4-10 (A-D)** presents the changes from the Existing Condition in monthly CCWD and Los Vaqueros Reservoir (LV) diversions for each project alternative. These tables also indicate whether the Delta is in excess or balanced conditions.

Monthly and year type average changes in various Delta parameters (Sacramento River flow at Hood, San Joaquin River flow at Vernalis, Delta Outflow, Combined Banks and Jones diversions, and combined CCWD and LV diversions) are presented in **Figure C4-22** through **Figure C4-26** and **Figure C4-32** through **Figure C4-36**, respectively. **Figure C4-27** shows the monthly average Los Vaqueros storage and **Figure C4-28** through **Figure C4-31** show time-series of storage for each alternative and the Existing Condition.

Figure C4-37 through **Figure C4-42** are exceedence plots of the end of September storage in upstream reservoirs (Trinity, Shasta, Oroville, and Folsom) and San Luis Reservoir (CVP and SWP).

TABLE C4-6:
SUMMARY COMPARISON OF ANNUAL AVERAGE DIVERSIONS, DELIVERIES, RIVER FLOWS, AND CARRYOVER STORAGE, 2005 LOD, MODERATE FISHERY RESTRICTIONS

(A) ALTERNATIVE 1 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 1		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	135	368	295	241	159	189%	118%
Banks Pumping Plant	2781	1597	2569	1465	-212	-132	-8%	-8%
Jones Pumping Plant	2287	1750	2287	1739	0	-11	0%	-1%
Total	5195	3482	5224	3499	29	16	1%	0%
Delta (cfs)								
Sacramento River at Hood	22,427	12,975	22,423	12,956	-4	-19	0%	0%
San Joaquin River at Vernalis	4,285	1,596	4,285	1,596	0	0	0%	0%
Delta Outflow	22,064	8,535	22,021	8,494	-43	-41	0%	0%
QWEST	2,861	43	2,820	20	-41	-24	-1%	-55%
X2 Position (km)	75.03	81.60	75.06	81.65	0.03	0.05	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,559	6,348	8,558	6,343	0	-5	0%	0%
American River below Nimbus Dam	3,492	1,667	3,492	1,666	0	-1	0%	0%
Feather River below Thermalito	4,403	2,315	4,401	2,305	-2	-10	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,399	780	1,397	767	-2	-13	0%	-2%
Shasta	2,749	1,615	2,744	1,606	-5	-10	0%	-1%
Oroville	2,184	1,246	2,191	1,271	7	24	0%	2%
Folsom	539	336	538	334	-1	-3	0%	-1%
CVP San Luis (August)	174	97	176	97	2	0	1%	0%
SWP San Luis (August)	255	124	253	124	-1	0	-1%	0%
Deliveries (TAF/yr)								
CVP SOD Ag	951	424	952	423	0	-1	0%	0%
CVP SOD M&I	118	100	118	100	0	0	0%	0%
SWP Table A + Article 56	2,630	1,566	2,637	1,568	7	2	0%	0%
SWP Article 21	97	0	97	0	0	0	0%	NA
Delta Supply Restoration + Dry Year	0	0	20	33	20	33	NA	NA

(B) ALTERNATIVE 2 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 2		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	135	387	311	260	176	204%	130%
Banks Pumping Plant	2781	1597	2577	1457	-204	-140	-7%	-9%
Jones Pumping Plant	2287	1750	2287	1750	0	0	0%	0%
Total	5195	3482	5251	3518	56	36	1%	1%
Delta (cfs)								
Sacramento River at Hood	22,427	12,975	22,425	13,010	-2	35	0%	0%
San Joaquin River at Vernalis	4,285	1,596	4,285	1,596	0	0	0%	0%
Delta Outflow	22,064	8,535	21,986	8,510	-78	-25	0%	0%
QWEST	2,861	43	2,783	-9	-79	-53	-3%	-122%
X2 Position (km)	75	82	75	82	0	0	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,559	6,348	8,557	6,376	-2	28	0%	0%
American River below Nimbus Dam	3,492	1,667	3,492	1,680	0	13	0%	1%
Feather River below Thermalito	4,403	2,315	4,402	2,313	-2	-2	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,399	780	1,395	760	-5	-20	0%	-3%
Shasta	2,749	1,615	2,738	1,554	-11	-62	0%	-4%
Oroville	2,184	1,246	2,188	1,253	4	7	0%	1%
Folsom	539	336	536	322	-3	-14	-1%	-4%
CVP San Luis (August)	174	97	174	97	-1	0	0%	0%
SWP San Luis (August)	255	124	255	122	0	-2	0%	-2%
Deliveries (TAF/yr)								
CVP SOD Ag	951	424	952	422	0	-2	0%	-1%
CVP SOD M&I	118	100	118	100	0	0	0%	0%
SWP Table A + Article 56	2,630	1,566	2,636	1,579	6	13	0%	1%
SWP Article 21	97	0	97	0	0	0	0%	NA
Additional SOD Env Water Supply	0	0	46	51	46	51	NA	NA

TABLE C4-6: SUMMARY COMPARISON OF ANNUAL AVERAGE DIVERSIONS, DELIVERIES, RIVER FLOWS, AND CARRYOVER STORAGE, 2005 LOD, MODERATE FISHERY RESTRICTIONS

(C) ALTERNATIVE 3 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 3		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	135	131	122	3	-13	3%	-10%
Banks Pumping Plant	2781	1597	2804	1628	23	31	1%	2%
Jones Pumping Plant	2287	1750	2292	1748	5	-2	0%	0%
Total	5195	3483	5227	3498	31	15	1%	0%
Delta (cfs)								
Sacramento River at Hood	22,427	12,975	22,423	12,997	-4	22	0%	0%
San Joaquin River at Vernalis	4,285	1,596	4,285	1,595	0	0	0%	0%
Delta Outflow	22,064	8,535	22,016	8,536	-47	2	0%	0%
QWEST	2,861	43	2,815	25	-46	-18	-2%	-41%
X2 Position (km)	75	82	75	82	0	0	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,559	6,348	8,557	6,362	-2	14	0%	0%
American River below Nimbus Dam	3,492	1,667	3,492	1,667	0	0	0%	0%
Feather River below Thermalito	4,403	2,315	4,402	2,317	-1	2	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,399	780	1,403	763	4	-17	0%	-2%
Shasta	2,749	1,615	2,744	1,593	-5	-23	0%	-1%
Oroville	2,184	1,246	2,191	1,271	7	25	0%	2%
Folsom	539	336	538	333	0	-3	0%	-1%
CVP San Luis (August)	174	97	177	96	2	-1	1%	-1%
SWP San Luis (August)	255	124	252	123	-3	-2	-1%	-1%
Deliveries (TAF/yr)								
CVP SOD Ag	951	424	950	419	-2	-5	0%	-1%
CVP SOD M&I	118	100	118	100	0	0	0%	0%
SWP Table A + Article 56	2,630	1,566	2,638	1,581	8	15	0%	1%
SWP Article 21	97	0	106	0	9	0	10%	NA
Additional SOD Env Water Supply	0	0	12	31	12	31	NA	NA

(D) ALTERNATIVE 4 COMPARED TO EXISTING CONDITION (NO ACTION)

	Existing Condition		Alternative 4		Difference (Alt – Ex. Cond.)		Percent Difference	
	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92	Avg	87 - 92
Diversions (TAF/yr)								
CCWD and LV Diversions	127	135	128	126	1	-9	1%	-7%
Banks Pumping Plant	2781	1597	2785	1597	4	-1	0%	0%
Jones Pumping Plant	2287	1750	2287	1749	0	-1	0%	0%
Total	5195	3483	5200	3471	5	-11	0%	0%
Delta (cfs)								
Sacramento River at Hood	22,427	12,975	22,421	12,956	-5	-19	0%	0%
San Joaquin River at Vernalis	4,285	1,596	4,285	1,596	0	0	0%	0%
Delta Outflow	22,064	8,535	22,054	8,531	-10	-4	0%	0%
QWEST	2,861	43	2,852	55	-9	12	0%	27%
X2 Position (km)	75	82	75	82	0	0	0%	0%
Upstream River Flows (cfs)								
Sacramento River at Keswick Dam	8,559	6,348	8,558	6,332	-1	-16	0%	0%
American River below Nimbus Dam	3,492	1,667	3,492	1,666	0	-1	0%	0%
Feather River below Thermalito	4,403	2,315	4,403	2,313	-1	-2	0%	0%
Reservoir Carryover Storage (TAF)								
Trinity	1,399	780	1,399	789	-1	9	0%	1%
Shasta	2,749	1,615	2,748	1,636	-1	20	0%	1%
Oroville	2,184	1,246	2,187	1,251	3	4	0%	0%
Folsom	539	336	539	337	0	1	0%	0%
CVP San Luis (August)	174	97	176	97	1	0	1%	0%
SWP San Luis (August)	255	124	253	125	-2	1	-1%	1%
Deliveries (TAF/yr)								
CVP SOD Ag	951	424	952	424	0	0	0%	0%
CVP SOD M&I	118	100	118	100	0	0	0%	0%
SWP Table A + Article 56	2,630	1,566	2,633	1,564	3	-3	0%	0%
SWP Article 21	97	0	97	0	1	0	1%	NA

TABLE C4-7:
ANNUAL VALUES BY WATER YEAR TYPE, 2005 LOD, MODERATE FISHERY RESTRICTIONS

Parameter	Long Term Average	Dry Period (87-92)	Wet	Above Normal	Below Normal	Dry	Critical
CCWD and LV Diversions (TAF/yr)							
Average Total Diversions Existing Condition	**127**	**135**	**122**	**132**	**134**	**133**	**119**
Changes under Alternative 1	241	159	281	253	249	231	146
Changes under Alternative 2	260	176	302	274	269	248	161
Changes under Alternative 3	3	-13	8	17	10	9	-37
Changes under Alternative 4	1	-9	8	5	3	-3	-13
Improved Fish Screening Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	202	130	242	204	204	179	144
Changes under Alternative 2	195	127	234	200	192	171	143
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Delta (cfs)							
Sacramento River at Hood Existing Condition	**22,427**	**12,975**	**33,129**	**25,438**	**18,578**	**15,496**	**11,113**
Changes under Alternative 1	-4	-19	0	27	-21	3	-30
Changes under Alternative 2	-2	35	-1	3	-34	13	5
Changes under Alternative 3	-4	22	0	22	8	18	-86
Changes under Alternative 4	-5	-19	-9	15	-1	1	-32
San Joaquin River at Vernalis Existing Condition	**4,285**	**1,596**	**7,529**	**4,017**	**3,337**	**2,246**	**1,686**
Changes under Alternative 1	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Delta Outflow Existing Condition	**22,064**	**8,535**	**40,180**	**24,043**	**14,617**	**10,505**	**6,857**
Changes under Alternative 1	-43	-41	-39	-34	-39	-61	-35
Changes under Alternative 2	-78	-25	-88	-82	-91	-88	-23
Changes under Alternative 3	-47	2	-45	-30	-18	-42	-111
Changes under Alternative 4	-10	-4	-8	-9	-3	-18	-8
Banks Pumping Plant Existing Condition	**3,833**	**2,206**	**4,933**	**4,076**	**3,740**	**3,241**	**2,207**
Changes under Alternative 1	-291	-182	-358	-283	-301	-253	-203
Changes under Alternative 2	-282	-185	-341	-286	-288	-244	-201
Changes under Alternative 3	32	43	26	29	26	29	60
Changes under Alternative 4	6	-1	3	15	4	15	-7
Jones Pumping Plant Existing Condition	**3,153**	**2,417**	**3,596**	**3,295**	**3,193**	**2,994**	**2,241**
Changes under Alternative 1	1	-15	12	4	-24	-1	7
Changes under Alternative 2	1	3	9	0	-26	5	6
Changes under Alternative 3	7	-3	9	-2	-12	20	15
Changes under Alternative 4	1	-2	0	-3	-7	8	2
Banks + Jones Exports Existing Condition	**6,986**	**4,623**	**8,529**	**7,371**	**6,934**	**6,235**	**4,448**
Changes under Alternative 1	-290	-197	-346	-279	-325	-254	-196
Changes under Alternative 2	-282	-182	-332	-285	-314	-239	-195
Changes under Alternative 3	39	40	34	28	14	49	75
Changes under Alternative 4	7	-3	3	12	-3	24	-5
Banks + Jones + CCWD + LV Diversions Existing Condition	**7,162**	**4,810**	**8,697**	**7,552**	**7,118**	**6,419**	**4,612**
Changes under Alternative 1	41	22	42	69	17	64	4
Changes under Alternative 2	76	60	85	90	57	102	27
Changes under Alternative 3	43	20	45	50	28	61	24
Changes under Alternative 4	8	-15	13	19	1	19	-23
QWEST Existing Condition	**2,861**	**43**	**7,142**	**2,839**	**1,205**	**-125**	**21**
Changes under Alternative 1	-41	-24	-42	-62	-22	-63	-8
Changes under Alternative 2	-79	-53	-84	-107	-65	-98	-25
Changes under Alternative 3	-46	-18	-45	-61	-24	-59	-40
Changes under Alternative 4	-9	12	-14	-16	-2	-21	17
X2 Position (km) Existing Condition	**75.03**	**81.60**	**68.64**	**73.21**	**76.51**	**79.24**	**82.64**
Changes under Alternative 1	0.03	0.05	0.02	0.03	0.03	0.06	0.04
Changes under Alternative 2	0.06	0.03	0.05	0.05	0.08	0.08	0.03
Changes under Alternative 3	0.03	0.05	0.01	0.01	0.00	0.05	0.11
Changes under Alternative 4	0.01	0.00	0.01	0.01	0.00	0.02	0.00
Upstream River Flows (cfs)							
Sacramento River at Keswick Existing Condition	**8,559**	**6,348**	**11,610**	**8,649**	**7,042**	**6,834**	**6,215**
Changes under Alternative 1	0	-5	4	7	-14	9	-16
Changes under Alternative 2	-2	28	-1	-6	-27	16	4
Changes under Alternative 3	-2	14	-1	14	-6	16	-44
Changes under Alternative 4	-1	-16	2	0	-3	6	-15
American River below Nimbus Existing Condition	**3,492**	**1,667**	**5,471**	**3,894**	**2,944**	**2,169**	**1,425**
Changes under Alternative 1	0	-1	0	1	-9	7	-2
Changes under Alternative 2	0	13	-1	-6	-9	9	5
Changes under Alternative 3	0	0	-1	0	0	7	-10
Changes under Alternative 4	0	-1	0	0	0	0	-1

TABLE C4-7:
ANNUAL VALUES BY WATER YEAR TYPE, 2005 LOD, MODERATE FISHERY RESTRICTIONS

Parameter	Long Term Average	Dry Period (87-92)	Wet	Above Normal	Below Normal	Dry	Critical
Feather River below Thermalito							
Existing Condition	**4,403**	**2,315**	**6,777**	**4,514**	**3,462**	**3,012**	**2,335**
Changes under Alternative 1	-2	-10	-2	29	-6	-14	-11
Changes under Alternative 2	-2	-2	-1	19	-4	-13	-2
Changes under Alternative 3	-1	2	1	8	17	-6	-32
Changes under Alternative 4	-1	-2	3	10	1	-4	-17
Reservoir Carryover Storage (TAF)							
Trinity Existing Condition	**1,399**	**780**	**1,856**	**1,635**	**1,274**	**1,134**	**719**
Changes under Alternative 1	-2	-13	-1	-2	-3	-2	-3
Changes under Alternative 2	-5	-20	-1	-8	-5	-5	-9
Changes under Alternative 3	4	-17	1	4	8	5	3
Changes under Alternative 4	-1	9	-1	-1	-2	0	0
Shasta Existing Condition	**2,749**	**1,615**	**3,335**	**3,229**	**2,874**	**2,431**	**1,328**
Changes under Alternative 1	-5	-10	0	-2	-9	-9	-7
Changes under Alternative 2	-11	-62	0	-3	-11	-14	-37
Changes under Alternative 3	-5	-23	0	-2	-1	-15	-9
Changes under Alternative 4	-1	20	-1	0	-1	-5	7
Oroville Existing Condition	**2,184**	**1,246**	**3,042**	**2,394**	**2,106**	**1,582**	**1,110**
Changes under Alternative 1	7	24	1	2	1	10	26
Changes under Alternative 2	4	7	1	1	-3	7	16
Changes under Alternative 3	7	25	0	10	-5	9	32
Changes under Alternative 4	3	4	-2	-1	2	6	14
Folsom Existing Condition	**539**	**336**	**646**	**605**	**590**	**447**	**318**
Changes under Alternative 1	-1	-3	0	-1	0	-5	1
Changes under Alternative 2	-3	-14	0	-1	-2	-7	-5
Changes under Alternative 3	0	-3	0	0	-2	-4	6
Changes under Alternative 4	0	1	0	0	0	0	1
CVP San Luis (August) Existing Condition	**174**	**97**	**240**	**147**	**150**	**132**	**152**
Changes under Alternative 1	2	0	0	-2	-3	4	10
Changes under Alternative 2	-1	0	-3	-3	-8	3	9
Changes under Alternative 3	2	-1	5	-1	-2	2	4
Changes under Alternative 4	1	0	0	0	-2	3	5
SWP San Luis (August) Existing Condition	**255**	**124**	**487**	**176**	**144**	**140**	**132**
Changes under Alternative 1	-1	0	1	-1	-1	1	-11
Changes under Alternative 2	0	-2	4	-2	0	0	-9
Changes under Alternative 3	-3	-2	1	0	-1	-2	-14
Changes under Alternative 4	-2	1	-2	-1	0	0	-8
CVP and SWP Deliveries (TAF/year)							
CVP SOD Ag Existing Condition	**951**	**424**	**1,346**	**1,046**	**923**	**737**	**355**
Changes under Alternative 1	0	-1	6	3	-11	4	-7
Changes under Alternative 2	0	-2	6	3	-10	4	-9
Changes under Alternative 3	-2	-5	0	0	-10	4	-7
Changes under Alternative 4	0	0	0	-2	-1	6	-3
CVP SOD M&I Existing Condition	**118**	**100**	**133**	**118**	**116**	**111**	**97**
Changes under Alternative 1	0	0	0	1	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	1	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
SWP Table A + Article 56 Existing Condition	**2,630**	**1,566**	**3,184**	**2,825**	**2,710**	**2,365**	**1,539**
Changes under Alternative 1	7	2	1	7	2	10	19
Changes under Alternative 2	6	13	2	4	-2	13	18
Changes under Alternative 3	8	15	3	1	5	5	38
Changes under Alternative 4	3	-3	4	0	3	5	3
SWP Article 21 Existing Condition	**97**	**0**	**215**	**97**	**54**	**19**	**5**
Changes under Alternative 1	0	0	0	2	0	0	0
Changes under Alternative 2	0	0	-1	1	0	0	0
Changes under Alternative 3	9	0	17	1	3	5	15
Changes under Alternative 4	1	0	-2	3	0	5	0
Improved Fish Screening for CVP South Bay							
Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	78	70	79	79	82	76	73
Changes under Alternative 2	75	71	76	76	78	73	73
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Improved Fish Screening for SWP South Bay							
Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	140	70	181	141	138	118	82
Changes under Alternative 2	135	69	177	139	131	113	81
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
CVP Delta Supply Restoration							
Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	4	4	3	3	3	4	6
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0

TABLE C4-7:
ANNUAL VALUES BY WATER YEAR TYPE, 2005 LOD, MODERATE FISHERY RESTRICTIONS

Parameter	Long Term Average	Dry Period (87-92)	Wet	Above Normal	Below Normal	Dry	Critical
SWP Delta Supply Restoration Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	16	29	8	9	11	20	41
Changes under Alternative 2	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0
Additional CVP SOD Environmental Water from Dedicated Storage Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	0	0	0	0	0	0	0
Changes under Alternative 2	46	51	35	37	45	54	69
Changes under Alternative 3	12	31	1	5	16	23	23
Changes under Alternative 4	0	0	0	0	0	0	0

TABLE C4-8:
AVERAGE MONTHLY VALUES, 2005 LOD, MODERATE FISHERY RESTRICTIONS

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CCWD and LV Diversions (TAF)												
Average Total Diversions												
Existing Condition	**7**	**6**	**6**	**6**	**8**	**8**	**2**	**11**	**22**	**21**	**18**	**12**
Changes under Alternative 1	14	17	20	21	17	27	-1	35	19	23	24	25
Changes under Alternative 2	15	20	24	25	19	29	-1	35	20	24	24	25
Changes under Alternative 3	-1	-1	-1	0	1	3	-1	8	-9	5	0	0
Changes under Alternative 4	0	0	0	0	0	0	-1	0	0	0	1	0
CVP-SWP Improved Fish Screening												
Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	13	16	19	20	16	23	0	11	17	20	23	24
Changes under Alternative 2	13	16	18	19	15	20	0	10	17	19	23	24
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Delta (cfs)												
Sacramento River at Hood												
Existing Condition	**12,136**	**15,406**	**25,620**	**34,425**	**40,290**	**35,005**	**24,146**	**19,826**	**16,705**	**17,866**	**14,287**	**13,406**
Changes under Alternative 1	43	9	-3	-5	-89	39	-87	65	63	39	-86	-32
Changes under Alternative 2	5	-3	-12	-23	-36	39	-84	55	82	54	-78	-23
Changes under Alternative 3	20	26	9	9	-128	75	-1	-10	-114	35	-90	120
Changes under Alternative 4	-24	-16	-1	6	-21	40	-7	9	-5	-9	-54	20
San Joaquin River at Vernalis												
Existing Condition	**2,548**	**2,731**	**3,484**	**4,857**	**6,595**	**6,478**	**6,023**	**6,066**	**4,684**	**3,247**	**2,131**	**2,571**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Delta Outflow Existing Condition	**5,216**	**9,457**	**23,899**	**43,760**	**54,987**	**44,781**	**29,264**	**21,649**	**13,342**	**8,461**	**4,492**	**5,456**
Changes under Alternative 1	-9	-18	-37	-104	-84	-42	95	-311	29	16	-31	-18
Changes under Alternative 2	-66	-76	-115	-230	-89	-108	91	-332	24	27	-39	-24
Changes under Alternative 3	-4	28	-7	-176	-186	-128	1	-140	49	-14	1	8
Changes under Alternative 4	15	-20	2	-72	-33	-12	-1	15	-6	2	2	-8
Banks Pumping Plant Existing Condition	**4,451**	**4,860**	**4,977**	**4,092**	**3,788**	**3,270**	**1,472**	**1,799**	**2,420**	**4,728**	**5,229**	**4,915**
Changes under Alternative 1	-165	-261	-302	-269	-301	-367	-247	-171	-280	-323	-403	-409
Changes under Alternative 2	-174	-265	-310	-259	-292	-327	-246	-160	-268	-310	-377	-400
Changes under Alternative 3	20	19	36	167	44	132	34	3	-4	-30	-113	77
Changes under Alternative 4	20	1	11	46	0	29	-1	-2	-3	5	-53	18
Jones Pumping Plant Existing Condition	**3,998**	**4,010**	**3,652**	**3,515**	**2,982**	**2,619**	**1,719**	**1,676**	**2,039**	**3,574**	**3,957**	**4,094**
Changes under Alternative 1	-5	9	16	23	-5	10	88	-28	-10	-25	-40	-18
Changes under Alternative 2	-12	8	22	46	4	9	89	-30	-14	-48	-53	-14
Changes under Alternative 3	20	0	10	8	-9	16	-13	-4	-5	1	19	41
Changes under Alternative 4	-10	3	-8	27	6	12	9	1	3	-23	-15	2
Banks + Jones Exports												
Existing Condition	**8,448**	**8,869**	**8,629**	**7,607**	**6,770**	**5,889**	**3,191**	**3,475**	**4,459**	**8,302**	**9,186**	**9,009**
Changes under Alternative 1	-170	-251	-287	-245	-306	-356	-159	-199	-290	-348	-443	-428
Changes under Alternative 2	-185	-256	-288	-213	-288	-317	-157	-189	-282	-358	-430	-414
Changes under Alternative 3	40	18	46	175	34	147	21	0	-9	-29	-94	119
Changes under Alternative 4	10	4	3	73	6	41	8	0	1	-18	-69	21

TABLE C4-8: AVERAGE MONTHLY VALUES, 2005 LOD, MODERATE FISHERY RESTRICTIONS

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Banks + Jones + CCWD + LV Diversions												
Existing Condition	**8,564**	**8,977**	**8,722**	**7,698**	**6,912**	**6,024**	**3,218**	**3,659**	**4,837**	**8,636**	**9,482**	**9,213**
Changes under Alternative 1	50	28	46	102	-3	87	-182	376	34	23	-55	-13
Changes under Alternative 2	62	73	109	201	54	152	-175	387	58	27	-39	1
Changes under Alternative 3	22	3	33	175	49	200	-2	130	-162	50	-91	112
Changes under Alternative 4	12	5	5	77	5	42	-6	-6	1	-11	-56	28
QWEST Existing Condition	**-1,036**	**-1,104**	**1,354**	**6,195**	**9,051**	**7,891**	**7,564**	**5,840**	**3,552**	**-720**	**-2,684**	**-1,568**
Changes under Alternative 1	-35	-27	-46	-103	-9	-82	170	-368	-17	-11	30	4
Changes under Alternative 2	-58	-74	-145	-205	-59	-147	164	-380	-36	-11	16	-8
Changes under Alternative 3	-15	2	-65	-173	-66	-190	2	-131	131	-39	64	-77
Changes under Alternative 4	-13	-8	-4	-77	-8	-36	5	8	-2	9	40	-22
X2 Position (km) Existing Condition	**85.22**	**85.33**	**82.71**	**76.84**	**69.57**	**64.18**	**63.91**	**66.55**	**69.78**	**74.56**	**78.06**	**83.60**
Changes under Alternative 1	0.04	0.00	0.02	0.03	0.06	0.06	0.03	-0.01	0.13	0.02	-0.02	0.04
Changes under Alternative 2	0.05	0.07	0.09	0.09	0.12	0.06	0.05	0.00	0.14	0.03	-0.03	0.05
Changes under Alternative 3	-0.02	-0.01	-0.02	0.04	0.10	0.13	0.07	0.02	0.07	-0.01	0.01	0.00
Changes under Alternative 4	0.01	0.00	0.02	0.00	0.04	0.03	0.01	0.00	-0.01	0.00	0.00	-0.01
E/I Ratio Existing Condition	**0.57**	**0.53**	**0.41**	**0.27**	**0.15**	**0.15**	**0.11**	**0.14**	**0.21**	**0.38**	**0.53**	**0.57**
Changes under Alternative 1	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Changes under Alternative 2	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00
Changes under Alternative 3	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Changes under Alternative 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upstream River Flows (cfs)												
Sacramento River at Keswick Dam												
Existing Condition	**6,305**	**5,876**	**7,238**	**8,658**	**10,907**	**8,800**	**7,015**	**7,797**	**10,501**	**13,005**	**10,107**	**6,498**
Changes under Alternative 1	3	21	4	-2	-51	23	-14	29	17	10	-18	-27
Changes under Alternative 2	-43	21	1	-17	-6	25	-14	16	24	23	-20	-30
Changes under Alternative 3	10	31	-5	-9	-106	2	-3	-25	-88	25	62	77
Changes under Alternative 4	14	-13	-7	-2	-13	10	-5	8	2	-11	10	0
American River below Nimbus Dam												
Existing Condition	**1,807**	**2,770**	**3,441**	**4,541**	**5,301**	**3,875**	**3,482**	**3,892**	**3,793**	**3,788**	**2,582**	**2,630**
Changes under Alternative 1	-1	-12	2	3	-19	7	-13	8	32	19	-32	6
Changes under Alternative 2	12	-23	-2	-11	-24	11	-14	7	38	18	-25	13
Changes under Alternative 3	-3	-13	8	-6	-5	13	0	4	-24	50	-26	0
Changes under Alternative 4	-9	-3	-2	10	-3	2	-2	1	2	-6	-9	18
Feather River below Thermalito												
Existing Condition	**3,367**	**2,492**	**4,357**	**5,576**	**6,565**	**6,730**	**3,148**	**3,758**	**3,806**	**6,195**	**4,694**	**2,153**
Changes under Alternative 1	42	2	7	-3	-18	8	-58	26	15	6	-38	-13
Changes under Alternative 2	29	-3	0	0	-5	-2	-56	29	20	16	-37	-9
Changes under Alternative 3	24	9	19	11	-25	44	5	11	-1	-44	-120	48
Changes under Alternative 4	26	0	18	-1	-13	17	0	-1	-9	8	-57	3
CVP and SWP Deliveries (TAF)												
CVP SOD Ag Existing Condition	**30**	**22**	**32**	**55**	**65**	**43**	**62**	**99**	**159**	**197**	**141**	**46**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	1	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	-1	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0

**TABLE C4-8:
AVERAGE MONTHLY VALUES, 2005 LOD, MODERATE FISHERY RESTRICTIONS**

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CVP SOD M&I Existing Condition	**9**	**11**	**12**	**8**	**4**	**12**	**10**	**9**	**9**	**11**	**11**	**13**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
SWP Table A + Article 56 Existing Condition	**207**	**177**	**163**	**139**	**134**	**131**	**190**	**246**	**307**	**347**	**340**	**248**
Changes under Alternative 1	0	0	0	0	0	0	0	1	2	1	1	0
Changes under Alternative 2	0	0	0	0	0	0	0	1	2	1	0	0
Changes under Alternative 3	1	1	1	1	1	1	0	0	2	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
SWP Article 21 Existing Condition	**6**	**7**	**9**	**11**	**23**	**25**	**5**	**4**	**1**	**1**	**1**	**2**
Changes under Alternative 1	0	0	0	0	1	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	1	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	1	6	2	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	1	1	0	0	0	0	0	0
Improved Fish Screening for CVP South Bay Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	7	10	10	5	2	8	5	2	6	6	8	9
Changes under Alternative 2	7	10	9	5	2	7	5	2	5	6	7	9
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Improved Fish Screening for SWP South Bay Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	6	6	9	15	14	15	11	9	12	14	15	15
Changes under Alternative 2	6	6	9	14	13	14	11	8	11	13	15	15
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
CVP South Bay Delta Supply Restoration Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	1	1	1	1	0	0	0	0	0	0	0	0
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
SWP South Bay Delta Supply Restoration Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	4	3	3	0	0	1	0	0	1	0	2	2
Changes under Alternative 2	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 3	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0
Additional CVP SOD Environmental Water from Dedicated Storage Existing Condition	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Changes under Alternative 1	0	0	0	0	0	0	0	0	0	0	0	0
Changes under Alternative 2	13	9	6	5	4	1	0	1	1	0	2	2
Changes under Alternative 3	2	0	0	0	0	0	0	0	0	1	2	7
Changes under Alternative 4	0	0	0	0	0	0	0	0	0	0	0	0

TABLE C4-9:
CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(A) Alternative 1

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	-470	-395	-449	-159	-112	-419	-165	-219	-405	-428	-475	-470
1923	-198	-274	-346	-521	-382	-470	-157	-195	-335	-384	-535	-424
1924	-170	-168	-312	-260	-214	-300	-251	-177	222	-267	-278	-162
1925	39	-361	-17	2845	-370	-267	0	0	0	-793	-780	-229
1926	-188	-95	-265	-226	-200	-300	-143	-135	-1	-623	-733	-601
1927	-129	-167	-1	0	-468	-204	-166	-222	-459	-456	-628	-804
1928	186	-305	-376	-468	-458	-469	-165	-210	-348	-329	-412	-632
1929	-180	-369	-4	-289	-246	-393	0	-314	-183	-209	-399	-268
1930	-105	-194	-136	0	0	-399	337	-220	-112	-386	-947	-206
1931	-133	-179	-239	-199	-169	-291	-249	-193	606	773	233	-83
1932	-136	173	-132	0	-122	-377	111	0	-146	0	500	-42
1933	-137	-176	102	-53	-32	-353	-249	-192	0	-243	-299	-288
1934	-10	-218	554	-666	-127	-384	0	-206	0	37	-255	-328
1935	-162	-135	276	-147	-131	-352	0	0	191	-905	-788	-428
1936	-206	-273	-316	-152	-121	0	-294	-361	-372	-340	-436	-429
1937	-189	-239	-310	-235	-270	-470	-329	-165	-1103	-398	-1036	-629
1938	-189	-249	-320	585	-463	-232	-304	-221	-470	-482	114	-470
1939	-1041	-470	-470	-470	-278	-179	-240	-310	-394	-124	-433	-431
1940	-101	-168	-339	-193	-161	0	-167	0	-387	-202	-438	-460
1941	-225	-307	-318	-319	-305	-354	-316	-248	-469	-479	-480	-470
1942	-240	-325	-394	-467	-464	-470	-248	-232	-470	-482	-480	-470
1943	-254	-464	-465	-470	-319	-401	-316	-641	-470	-470	-470	-470
1944	207	86	-1013	-470	-467	-470	-143	-93	-330	-390	-409	-717
1945	-612	-237	-301	-282	-419	321	-157	-217	-433	-753	-253	-473
1946	-237	-288	-358	-470	-871	-470	-157	-219	-338	-460	-537	-363
1947	-133	-245	-305	-270	-232	-455	-143	24	-117	-430	-552	-458
1948	-182	346	-611	-204	0	-347	-140	-228	-217	-396	-413	-240
1949	-196	-236	-231	-350	-208	-433	-286	-289	0	-77	-328	-363
1950	-106	-194	-322	-248	0	-400	-157	-218	-318	-457	-451	-325
1951	-129	-221	-286	-462	-223	-742	-163	-220	-442	-446	-469	-470
1952	-244	-302	-372	-443	-241	-468	-316	-222	-428	-456	-470	-470
1953	-471	-470	-243	-409	-406	-183	-157	-223	-416	-437	-495	-466
1954	-206	-267	-339	-470	-459	-470	-165	-197	-393	-427	-448	-413
1955	-157	-252	-323	2560	-404	-470	0	-223	-720	-500	-356	-836
1956	-126	-218	-210	438	2	-125	-169	-225	-470	-467	-470	-469
1957	-260	-333	-400	-470	-470	-470	-320	-227	-355	-441	-423	-421
1958	-187	-259	-323	-1497	-394	-371	241	-284	-470	-482	-470	-470
1959	-347	-472	-469	-348	-470	-470	0	-300	-362	-546	-375	-411
1960	-215	-198	-337	-412	-352	-470	-279	0	0	-156	-191	-345
1961	-73	-200	-542	-226	-201	-429	0	-291	-10	333	-420	-462
1962	-254	-628	-199	-369	-238	-456	-157	-300	0	-409	-94	-429
1963	-169	-246	-318	-423	-391	-469	-169	-236	-348	-379	-410	-418
1964	-61	-239	-340	-320	-283	-470	-134	-292	-334	-401	-434	-624
1965	43	-237	-21	-126	-206	-444	-169	-195	-576	-275	-428	-421
1966	-145	-234	-306	-414	-384	-470	-157	-236	-371	-453	-394	-434
1967	-162	-242	-314	-417	-404	-132	-316	-240	-401	-431	-468	-474
1968	-455	-469	-456	-438	-163	-323	-381	-218	-427	-380	-470	-451
1969	-215	-291	-359	1042	-1390	-529	-303	-208	-470	-470	-470	-470
1970	-470	-458	-252	-459	-467	-329	-10	-216	-470	-394	-468	-469
1971	-190	-328	-398	-467	-470	-470	-169	-221	-213	-390	-407	-424
1972	-171	-238	-300	-272	-235	-470	-314	-219	-373	-554	-530	-435
1973	41	-247	-290	-416	-397	-462	-165	-218	-438	-441	-479	-449
1974	-217	-286	-357	-466	-470	-365	-169	-222	-470	-495	-469	-460
1975	-275	-352	-420	-470	-470	-460	-169	-222	-430	-448	-470	-471
1976	-213	-288	-470	-470	-200	-172	0	-301	-381	-607	-605	-430
1977	-160	-104	-312	-232	-300	-335	-208	-113	-37	-132	-1503	-356
1978	2144	496	-123	-83	-170	-373	-1	1	1	-51	-469	1
1979	-280	-363	-408	-367	0	-414	-73	-219	-354	-498	-472	-404
1980	-144	-239	-307	-441	-316	-425	-309	-222	-470	-469	-469	-469
1981	-253	-248	-404	-470	-470	-212	0	-266	-345	-385	-392	-755
1982	-115	-235	-77	-316	-463	-449	-319	-233	-470	-469	-470	-470
1983	-284	-357	-497	-470	-390	-435	-316	-239	-470	-470	-470	-470
1984	-470	-456	-451	-470	-354	-396	0	-217	-429	-450	-467	-435
1985	-153	-287	-358	-470	-463	-470	0	-217	-377	-527	-557	-421
1986	-79	-221	-313	-416	-382	-36	-316	-123	-421	536	-1168	-470
1987	-209	-284	103	-1438	-425	-470	-344	0	-330	-334	-364	-493
1988	-169	-229	-298	-248	-208	6	-133	-375	-171	-230	-195	-245
1989	-122	-153	-199	-112	-58	-302	-225	0	0	-17	-295	-483
1990	-232	-365	-312	-288	-246	0	-244	-156	57	-128	-264	-216
1991	81	-30	45	55	-48	-319	0	-152	-166	-693	-196	-216
1992	-107	-97	-187	-75	-49	-265	0	158	0	257	-478	-263
1993	-86	-21	-31	-111	-139	-444	-23	0	0	-27	-685	-475
1994	-53	-267	-320	-467	-434	-468	-133	-289	-233	-406	-425	-396
1995	-273	-135	-321	-253	3	-469	-558	0	0	0	0	-422
1996	-419	-472	-252	-467	-464	-464	-169	-228	-497	-455	-455	-469
1997	-273	-346	-415	-467	-470	-419	-169	-218	-411	-448	-469	-469
1998	-151	-295	-349	-470	-440	-355	-253	-237	-470	-470	-470	-470
1999	-470	-470	-452	-466	-365	-331	-166	-223	-451	-465	-465	-469
2000	-231	-330	-330	-470	-454	-470	-8	-367	-392	-355	-380	-442
2001	-177	-228	-310	-427	-381	-13	-143	-220	-318	-434	-466	-545
2002	-223	-572	-285	-242	0	-428	-143	-252	-183	-442	-445	-433
2003	-194	-190	-269	-56	-240	-447	-165	-232	-230	-307	-283	-491
Average	**-170**	**-251**	**-287**	**-245**	**-306**	**-356**	**-159**	**-199**	**-290**	**-348**	**-443**	**-428**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-9: CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(B) Alternative 2

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	-470	-395	-449	-159	-112	-408	-165	-219	-405	-428	-475	-470
1923	-198	-274	-346	-364	-382	-470	-157	-122	-335	-384	-535	-424
1924	-170	-150	-311	-260	-214	-300	-254	-174	213	-271	-282	-159
1925	41	-359	-259	2845	-133	-300	0	0	0	-793	-965	-114
1926	-221	-121	-263	-225	-199	-300	-143	-128	-1	-593	-710	-566
1927	-135	-169	-1	0	0	-9	-169	-222	-459	-456	-522	-804
1928	182	-304	-375	-468	-458	-469	-165	-210	-348	-331	-412	-629
1929	-172	-369	5	-290	-246	-394	0	-312	-179	-204	-396	-255
1930	-98	-188	-136	0	0	0	337	-1	-112	-381	-943	-207
1931	-131	-177	-237	-199	-169	-291	-249	-193	616	756	222	-74
1932	-234	42	-132	0	-121	-375	108	0	-148	0	257	-38
1933	-135	-173	208	-71	-56	-353	-249	-192	0	-243	-320	-285
1934	-5	-223	562	-675	-127	-385	0	-206	0	34	-254	-328
1935	-162	-134	277	-147	-131	-352	0	0	191	-896	-778	-430
1936	-208	-275	-316	-151	-121	0	-294	-362	-372	-70	-688	-428
1937	-195	-239	-310	-261	462	-478	-329	-167	-1094	-387	-1200	-629
1938	-195	-249	-167	1052	-463	-167	-317	-222	-470	-482	114	-470
1939	-1044	-471	-470	-470	-278	-179	-287	-310	-394	-86	-427	-429
1940	-82	-152	-342	-194	-162	0	-167	0	-387	-424	-438	-457
1941	-98	-188	-318	-347	-332	0	-316	-240	-447	-457	-481	-470
1942	-241	-325	-395	-426	-457	-470	-248	-232	-470	-482	-480	-470
1943	-254	-464	-465	-436	-321	-401	-316	-642	-470	-470	-470	-470
1944	215	87	-1019	-470	-467	-470	-143	-92	-91	-390	-409	-726
1945	-623	-237	-301	-282	-419	433	-157	-125	-432	-756	-255	-473
1946	-242	-288	-307	-470	-868	-470	-157	-219	-338	-460	-537	-363
1947	-133	-246	-305	-270	-232	-455	-143	26	0	-294	-558	-456
1948	-190	-249	-315	-190	0	0	-157	-224	-217	-393	-411	-236
1949	-195	-236	-238	-345	-208	-433	-286	-290	0	156	-268	-339
1950	-76	-172	-338	-249	0	0	-157	0	-271	-532	-516	-323
1951	-138	-220	-240	-439	-223	-743	-163	-220	-442	-446	-469	-469
1952	-150	-303	-373	-449	-262	-469	-316	-222	-428	-456	-470	-470
1953	-468	-468	-243	-405	-411	-183	-132	-223	-416	-439	-494	-468
1954	-206	-268	-339	-470	-460	-470	-165	-197	-393	-428	-448	-403
1955	-154	-252	-324	2679	-405	-470	0	-223	-720	-500	-359	-836
1956	-132	-217	-209	424	2	99	-169	-225	-470	-467	-470	-469
1957	-260	-333	-400	-470	-470	-470	-320	-227	-355	-441	-423	-421
1958	-187	-259	-323	-283	-452	-428	-291	-284	-470	-482	-470	-470
1959	-358	-472	-470	-348	-470	-474	0	-300	-362	-545	-374	-411
1960	-211	-202	-336	-412	-352	-470	-283	0	0	34	-193	-345
1961	-74	-233	-746	-226	-201	-429	0	-290	-9	567	-427	-447
1962	-331	-820	-156	-366	-232	-453	-157	-300	0	-405	252	-432
1963	-170	0	-319	-424	-391	-469	-169	-236	-348	-379	-410	-413
1964	-47	-239	-457	-320	-283	-470	-144	-291	-334	-388	-422	-666
1965	33	-236	-21	0	-206	-445	-169	-195	-575	-275	-428	-421
1966	-146	-234	-281	-414	-384	-470	-157	-235	-371	-453	-396	-431
1967	-164	-269	-314	-417	-404	0	-316	-115	-401	-431	-468	-442
1968	-460	-473	-462	-442	-158	-323	-380	-218	-427	-379	-469	-451
1969	-214	-293	-359	1042	-1282	-504	-303	-208	-470	-470	-470	-470
1970	-470	-458	-252	-427	-467	-329	-12	-216	-470	-394	-467	-469
1971	-180	-328	-398	-465	-470	-470	-169	-221	-213	-389	-407	-424
1972	-203	-238	-300	-272	-235	-470	-314	-219	-373	-538	-514	-436
1973	21	-247	-104	-415	-396	-462	-165	-218	-439	-444	-480	-450
1974	-217	-286	-357	-462	-470	-368	-169	-222	-470	-491	-469	-459
1975	-275	-352	-420	-470	-470	-460	-169	-222	-430	-448	-470	-471
1976	-213	-288	-470	-470	-201	-172	0	-301	-381	-650	-636	-422
1977	-160	-157	-312	-228	-297	-343	0	-109	-70	-132	-1495	6
1978	1096	270	-123	-83	-170	-371	1	-189	4	64	-470	-1
1979	-280	-363	-473	-344	0	-309	-72	-219	-355	-488	-465	-408
1980	-153	-240	-308	-221	-273	-425	-309	-222	-470	-469	-469	-469
1981	-253	-248	-404	-470	-470	-65	0	-266	-345	-378	-388	-756
1982	-119	-235	0	-315	-470	-456	-319	-233	-470	-469	-470	-470
1983	-284	-357	-472	-421	-389	-409	-316	-239	-470	-470	-470	-470
1984	-470	-456	-452	-469	-354	-396	0	-217	-429	-450	-468	-440
1985	-156	-287	-355	-470	-463	-470	0	-217	-377	-527	-557	-426
1986	-77	-216	-313	-416	-382	-32	-316	0	-375	-902	215	-470
1987	-209	-284	-398	-16	-427	-470	-341	0	-337	-343	-369	-271
1988	-182	-234	-294	-255	-218	5	-133	-372	-38	-306	-241	-247
1989	-117	-158	-180	-110	-57	-296	-268	0	0	36	-324	-481
1990	-217	-270	-312	-285	-239	0	-245	-157	157	-101	-240	-217
1991	70	-11	44	1	-49	-321	0	-152	-167	-653	-196	-216
1992	-107	-111	-165	-116	-49	-261	0	0	0	-79	-269	-265
1993	-143	-21	-44	-110	-134	-442	0	0	0	6	-673	-465
1994	-208	-268	-330	-464	-429	-470	-133	-287	-232	-406	-425	-424
1995	-277	-135	-336	-252	3	-469	-526	0	0	0	0	-52
1996	-412	-472	-252	-443	-423	-464	-169	-228	-497	-455	-456	-469
1997	-272	-346	-415	-443	-470	-419	-169	-218	-411	-448	-469	-469
1998	-151	-295	-349	-1684	-440	-3	282	-212	-470	-470	-470	-470
1999	-470	-470	-452	-466	-365	-331	-166	-223	-451	-465	-465	-469
2000	-231	-331	-329	-470	-454	-422	-7	-367	-392	-355	-381	-443
2001	-173	-227	-306	-427	-381	0	-143	0	-317	-438	-488	-527
2002	-187	-227	-285	-242	0	-83	-143	-251	-183	-510	-512	-473
2003	-220	-188	-268	0	-270	-447	-165	-232	-230	-302	-284	-501
Average	**-185**	**-256**	**-288**	**-213**	**-288**	**-317**	**-157**	**-189**	**-282**	**-358**	**-430**	**-414**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-9: CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(C) Alternative 3

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	0	0	0	0	0	-11	0
1923	-8	0	0	0	0	0	0	0	0	0	0	0
1924	53	55	-6	0	0	0	-1	-7	207	-178	-124	77
1925	127	-189	110	2940	0	2988	0	0	0	-786	-3529	873
1926	-177	-8	8	0	0	0	0	59	0	-18	117	811
1927	-7	0	0	0	0	0	0	0	0	43	0	85
1928	-42	0	0	0	0	0	0	0	0	-363	0	504
1929	-13	247	-445	0	0	2	0	-73	-94	-25	65	43
1930	-17	-30	0	0	0	0	0	0	29	196	146	-12
1931	2	1	0	0	0	76	0	130	74	-50	-32	168
1932	233	29	0	0	0	-179	104	0	-52	0	789	259
1933	4	3	1188	3160	1618	0	0	0	0	0	-1882	39
1934	547	-505	1372	998	1659	-2	0	0	0	-233	502	-6
1935	-110	53	506	0	0	0	0	0	191	201	143	147
1936	-3	-213	99	0	0	0	0	0	-1	-26	80	234
1937	9	44	35	1	-332	439	447	90	-854	-349	-955	-147
1938	25	-1	0	2138	-31	-263	-25	-2	0	-12	133	0
1939	-128	-1	-1	0	0	0	0	0	0	-8	7	187
1940	31	27	14	0	0	0	0	0	0	245	0	0
1941	-177	-183	0	0	0	1	0	50	-52	-50	-10	0
1942	0	0	0	0	0	24	0	0	0	-12	-11	0
1943	0	0	0	0	5	0	3	-146	-2	-2	-2	0
1944	196	145	-233	0	0	0	0	-44	0	-1	-1	-76
1945	-441	0	0	0	42	480	0	0	0	-131	378	-3
1946	-74	-1	0	0	-543	0	0	0	0	0	0	15
1947	-15	85	0	24	0	0	0	6	0	-10	158	368
1948	17	68	-5	0	0	0	0	0	0	0	0	192
1949	-201	229	18	88	0	0	0	0	0	-317	-198	284
1950	-121	-85	87	0	0	0	0	0	0	195	183	73
1951	50	0	0	174	0	844	0	0	0	21	0	0
1952	-138	0	0	0	0	0	0	0	0	0	0	0
1953	-4	-4	0	0	0	0	0	0	0	1	-23	2
1954	-5	0	0	0	0	0	0	0	0	-186	0	186
1955	-111	0	0	2781	-2	0	0	0	-459	-110	-35	88
1956	31	48	1	771	2	1903	0	0	0	2	99	0
1957	0	0	0	0	0	0	0	0	0	53	0	191
1958	0	0	0	-1214	0	99	552	0	0	-12	0	0
1959	0	-2	4	0	0	1	0	0	0	-278	117	393
1960	-256	458	-189	0	0	0	0	0	0	-114	-102	502
1961	-24	9	101	0	0	0	0	0	124	-282	16	542
1962	-120	550	-84	310	0	8	0	0	0	18	87	59
1963	0	0	0	0	0	0	0	0	0	6	0	-47
1964	111	0	-32	0	-1	0	77	0	0	-62	-62	-5
1965	-62	0	0	0	0	0	0	0	0	-2	-35	0
1966	-1	0	0	0	0	0	0	-15	0	-11	14	-19
1967	18	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	599	87	0	0	0	-73	149	177
1969	-43	68	0	1512	-1324	-65	14	13	0	170	27	0
1970	0	13	0	12	0	1008	-43	0	0	43	111	-1
1971	-37	0	0	0	0	0	0	0	0	0	0	0
1972	-49	10	0	0	0	0	0	0	0	-148	204	71
1973	-70	0	0	0	0	0	0	0	0	-7	-7	51
1974	0	0	0	0	0	1056	0	0	0	-520	0	0
1975	0	0	0	0	0	0	0	0	0	-132	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	676
1977	244	-456	0	161	826	-58	0	-19	49	0	-931	-344
1978	2229	623	0	0	0	132	-571	75	186	-350	-363	1
1979	147	-1	24	0	0	0	0	0	0	98	6	-17
1980	177	0	0	-133	82	-1	0	0	0	173	100	1
1981	69	-1	0	0	0	0	0	0	0	-240	-169	444
1982	130	0	0	0	0	9	-12	0	0	171	0	0
1983	0	0	-281	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	795	0	0	0	86	6	-32
1985	49	0	0	0	0	0	0	0	0	-1	0	-11
1986	-58	-13	0	0	0	-5	445	47	0	2467	-1418	0
1987	2	-2	768	475	257	740	0	0	0	-381	-1003	237
1988	796	135	167	0	-35	-3	0	-356	0	-247	-70	359
1989	-2	-6	2	0	0	0	0	0	0	37	6	477
1990	144	-171	0	0	-4	0	0	0	-73	156	168	-1
1991	168	120	175	131	0	0	0	0	0	-318	0	209
1992	95	64	-41	-1	0	0	0	176	0	-405	-83	5
1993	16	147	119	0	0	0	0	0	0	5	-519	4
1994	30	76	-16	0	0	0	0	0	-1	-6	-4	719
1995	-28	127	235	-1	3	1	-32	0	0	0	0	0
1996	0	-2	0	0	0	0	0	0	-26	13	13	0
1997	-4	0	0	0	0	1197	0	0	0	-93	-140	43
1998	59	15	0	0	0	0	787	0	0	0	0	0
1999	-2	-2	0	0	0	772	0	0	0	-12	-12	0
2000	0	-7	30	0	0	0	0	-12	0	-135	199	105
2001	-99	-56	58	0	0	0	0	0	0	28	5	322
2002	142	-1	0	0	0	0	0	0	0	-74	25	238
2003	-11	0	0	0	-8	0	0	0	0	-7	0	-15
Average	**40**	**18**	**46**	**175**	**34**	**147**	**21**	**0**	**-9**	**-29**	**-94**	**119**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-9:
CHANGES IN BANKS + JONES EXPORTS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(D) Alternative 4

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	0	0	0	0	0	-4	0
1923	-3	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	-3	0	0	0	0	-4	-5	4	3	82
1925	114	-164	107	2940	0	2988	0	0	0	-1030	-3789	872
1926	-179	-6	9	0	0	0	0	83	0	204	293	297
1927	105	0	0	0	0	0	0	0	0	-5	-1	459
1928	-162	0	0	0	0	0	0	0	0	-9	0	77
1929	-11	36	-79	0	0	0	0	-47	-46	-55	-41	-21
1930	-5	-21	0	0	0	0	0	0	-44	26	-27	-21
1931	-6	-5	-4	0	0	69	0	-4	362	0	1	0
1932	-59	125	0	0	0	0	104	0	22	0	589	246
1933	-4	-3	-555	35	42	0	0	0	0	0	96	7
1934	-19	45	-66	96	0	0	0	0	0	196	-27	-4
1935	-1	-3	40	0	0	0	0	0	191	-582	-503	40
1936	-6	-4	853	0	0	0	0	0	0	-21	-145	0
1937	-4	1	0	0	129	-1	-2	-5	-5	-4	-5	0
1938	0	0	0	-40	-4	-8	0	0	0	-4	-12	0
1939	17	0	0	0	0	0	0	0	0	0	0	-7
1940	-2	1	-3	0	0	0	0	0	0	23	0	-1
1941	112	42	0	0	0	0	0	0	-4	-3	-4	0
1942	0	0	0	0	0	0	0	0	0	-4	-4	0
1943	0	0	0	0	-1	0	0	0	0	0	0	0
1944	5	0	1	0	0	0	0	0	0	0	0	-4
1945	6	0	0	0	4	-4	0	0	0	1	-65	0
1946	-10	0	0	0	68	0	0	0	0	0	0	-2
1947	-1	-4	0	0	0	0	0	1	0	-1	-14	-1
1948	4	0	2	0	0	0	0	0	0	0	0	-59
1949	6	2	-8	34	0	0	0	0	0	-73	-64	-22
1950	-27	-19	7	0	0	0	0	0	0	49	45	-54
1951	8	0	0	138	0	-6	0	0	0	-9	0	0
1952	14	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	-8	0
1954	-2	0	0	0	0	0	0	0	0	-24	0	-3
1955	2	0	0	2781	-2	0	0	0	-459	-219	-29	-249
1956	4	-22	1	1034	2	249	0	0	0	3	0	0
1957	0	-1	0	0	0	0	0	0	0	-9	0	-2
1958	0	0	0	0	0	0	7	0	0	-4	0	0
1959	0	-1	0	0	0	0	0	0	0	-8	0	0
1960	2	0	-2	0	0	0	0	0	0	0	0	1
1961	0	0	7	0	0	0	0	0	0	-7	0	0
1962	-3	7	2	0	0	-2	0	0	0	0	0	14
1963	0	0	0	0	0	0	0	0	0	-142	0	1
1964	0	0	5	0	-1	0	3	0	0	-5	-4	-15
1965	1	0	0	0	1	0	0	0	0	2	0	0
1966	1	0	0	0	0	0	0	0	0	-7	1	-2
1967	1	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	1	0	0	0	0	-7	0	0
1969	-1	1	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	-7	0	0
1971	-4	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	-7	-1	0
1973	8	0	0	0	0	0	0	0	0	0	-2	0
1974	0	0	0	0	0	2	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	8	127	0	125	0	54	0	-7	23	0	-1374	165
1978	1247	395	0	0	0	-2	1	-191	4	81	4	-1
1979	-190	2	-41	0	0	0	0	0	0	15	-171	-38
1980	-212	0	0	237	217	1	0	0	0	1	1	1
1981	1	9	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	1	0	0
1983	0	0	-1	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	-4
1985	-8	0	0	0	0	0	0	0	0	0	0	-1
1986	-3	0	0	0	0	-1	0	0	0	135	-196	0
1987	-1	0	-12	-133	0	0	0	0	0	1	-23	-52
1988	4	1	-3	0	1	0	0	0	0	-2	-1	-1
1989	-1	0	0	0	0	0	0	0	0	7	5	-2
1990	6	0	0	0	-2	0	0	0	12	5	-12	-1
1991	10	-6	23	-88	0	0	0	0	0	34	0	0
1992	0	-5	1	6	0	0	0	165	0	40	-167	2
1993	50	0	-57	0	0	0	0	0	0	-6	-1	-2
1994	27	2	9	0	0	1	0	0	0	0	0	2
1995	2	1	5	0	0	0	0	0	0	0	0	0
1996	0	-196	0	0	0	0	0	0	9	-4	-4	0
1997	0	0	0	0	0	0	0	0	0	-10	0	0
1998	16	-4	0	-1214	0	-3	544	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	2	2	0
2000	0	-8	5	0	0	0	0	0	0	-10	1	-3
2001	3	-2	3	0	0	0	0	2	0	-5	-4	-1
2002	-5	0	0	0	0	0	0	0	0	3	3	2
2003	-2	0	0	0	0	0	0	0	0	-4	0	1
Average	**10**	**4**	**3**	**73**	**6**	**41**	**8**	**0**	**1**	**-18**	**-69**	**21**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-10:
CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(A) Alternative 1

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	470	395	470	182	-54	636	0	670	339	440	475	458
1923	247	327	390	535	383	452	0	670	328	397	414	459
1924	175	249	312	264	257	305	0	177	202	182	168	162
1925	-12	26	60	-12	261	311	-162	645	470	470	470	378
1926	142	204	277	252	12	300	0	415	470	384	249	360
1927	136	222	470	470	384	199	0	670	333	482	481	458
1928	312	251	487	470	465	470	0	670	217	400	420	446
1929	184	247	311	294	292	388	0	178	424	363	245	267
1930	124	160	125	470	470	570	0	670	102	138	216	335
1931	133	179	239	240	190	287	-181	13	-1	27	49	83
1932	-61	71	152	470	-72	370	0	670	470	470	470	294
1933	138	176	155	184	160	394	-42	304	470	62	288	288
1934	-48	1	17	23	-59	385	0	206	470	470	181	328
1935	147	56	15	18	-65	270	-111	615	470	470	532	430
1936	206	273	338	183	-59	570	0	670	300	497	436	457
1937	190	259	326	265	232	370	0	670	470	237	347	432
1938	195	362	461	440	420	469	0	670	348	482	481	478
1939	474	472	470	477	298	352	0	310	394	402	308	470
1940	203	271	337	217	185	541	-117	653	319	234	327	458
1941	172	246	397	323	313	570	0	670	298	482	481	478
1942	306	352	418	462	470	472	0	670	355	482	481	478
1943	321	469	468	466	326	446	0	670	347	482	481	458
1944	258	339	407	471	471	370	0	670	470	216	335	401
1945	178	322	349	291	474	570	0	670	259	285	435	458
1946	208	285	601	470	456	473	0	670	192	400	416	439
1947	172	240	420	267	245	470	0	670	470	244	362	451
1948	180	252	324	218	470	552	-136	657	261	224	300	457
1949	150	222	291	231	202	470	0	440	470	470	328	414
1950	161	227	294	258	470	570	-73	652	145	194	268	459
1951	123	211	556	468	237	372	0	670	340	477	481	458
1952	334	288	405	439	470	369	0	670	336	482	481	478
1953	475	470	277	411	415	275	0	670	347	452	481	478
1954	206	317	361	467	377	558	0	670	340	426	458	458
1955	220	347	377	470	290	474	0	670	93	300	318	311
1956	127	177	265	344	414	433	0	670	349	482	481	477
1957	327	333	424	467	467	512	0	670	308	416	433	446
1958	300	355	361	282	396	469	0	670	408	482	480	478
1959	414	472	467	350	469	474	0	480	496	413	296	440
1960	164	239	313	410	344	370	0	670	470	220	245	368
1961	132	318	271	224	211	370	0	442	470	439	285	428
1962	174	240	306	174	161	457	-136	280	470	470	411	436
1963	292	368	167	425	399	471	0	670	237	400	421	458
1964	257	274	375	323	287	473	0	443	472	401	407	421
1965	153	312	59	470	65	447	0	670	341	398	428	449
1966	154	190	457	417	391	474	0	670	224	402	436	426
1967	157	338	359	419	213	570	0	670	295	424	481	478
1968	475	471	470	445	173	361	0	670	280	461	479	449
1969	204	285	434	467	442	364	0	670	325	482	481	478
1970	473	471	288	463	471	352	0	670	344	482	481	458
1971	313	355	439	470	472	472	0	670	190	401	454	453
1972	228	237	326	277	265	474	0	670	226	406	439	438
1973	270	297	356	397	402	471	0	670	308	471	481	458
1974	343	354	395	469	472	471	0	670	347	481	481	460
1975	359	379	443	469	468	469	0	670	349	463	480	478
1976	400	369	471	471	219	213	0	301	388	409	444	339
1977	7	115	179	228	157	268	-181	-33	-91	-79	99	158
1978	87	129	147	65	175	470	0	470	470	470	470	406
1979	287	477	441	376	470	658	0	670	208	403	424	458
1980	181	347	153	689	265	466	0	670	342	481	481	458
1981	266	249	478	474	275	670	0	670	173	397	389	440
1982	180	328	470	89	470	467	0	670	357	482	481	476
1983	348	379	468	464	418	450	0	670	364	482	480	477
1984	474	466	465	471	364	419	0	670	304	465	481	458
1985	221	311	512	470	471	471	0	670	204	409	413	447
1986	177	251	386	430	395	529	-86	653	297	272	358	477
1987	210	284	361	472	441	370	0	670	228	297	377	420
1988	170	235	298	295	11	570	0	670	446	36	179	245
1989	122	171	157	113	-54	470	-162	655	470	384	338	437
1990	170	244	207	233	250	570	-80	149	102	27	24	63
1991	-68	-17	-21	-50	-102	233	-181	100	148	36	196	216
1992	107	152	142	100	62	303	0	623	470	433	219	303
1993	132	21	17	4	85	470	-121	470	470	470	470	365
1994	208	280	348	476	475	470	0	288	233	401	450	438
1995	38	135	217	195	470	270	-114	634	470	470	533	658
1996	475	472	282	465	466	472	0	670	352	482	481	478
1997	273	395	434	462	472	474	0	670	345	446	480	458
1998	220	295	400	479	451	521	0	670	297	394	481	478
1999	475	470	464	469	379	354	0	670	347	482	481	478
2000	237	356	383	474	466	532	0	670	218	413	459	444
2001	191	272	342	466	398	570	0	670	144	190	284	405
2002	157	226	387	249	470	561	0	429	470	163	328	370
2003	140	240	315	470	73	479	0	670	109	295	295	433
Average	**220**	**279**	**332**	**348**	**303**	**444**	**-23**	**575**	**324**	**371**	**388**	**414**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-10:
CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(B) Alternative 2

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	470	395	470	415	-62	636	0	670	339	440	475	458
1923	247	473	473	535	382	452	0	670	328	397	414	459
1924	174	248	311	263	343	304	0	176	199	180	167	159
1925	-14	24	322	102	16	470	-162	645	470	470	470	375
1926	141	200	275	473	11	300	0	471	470	384	251	359
1927	134	478	470	470	470	570	0	670	333	482	481	458
1928	473	389	565	470	471	470	0	670	217	401	420	446
1929	176	241	307	292	380	388	0	178	410	363	235	255
1930	116	155	417	470	470	570	0	670	396	138	216	330
1931	131	177	237	450	165	284	-181	9	-5	20	41	74
1932	106	151	452	470	9	370	0	670	470	470	470	291
1933	135	173	152	394	135	470	-42	304	470	62	286	285
1934	-49	0	15	270	-73	385	0	206	470	470	181	328
1935	146	55	15	271	-69	270	0	615	470	470	532	430
1936	208	275	340	419	-68	570	0	670	300	497	654	457
1937	195	264	330	482	303	370	0	670	470	412	348	433
1938	201	490	470	459	463	469	0	670	348	482	481	478
1939	474	472	470	479	419	470	0	310	394	402	308	473
1940	207	274	340	461	181	541	-117	653	319	470	327	458
1941	180	252	475	471	464	570	0	670	298	482	481	478
1942	474	471	469	462	470	472	0	670	355	482	481	478
1943	474	469	468	466	452	471	0	670	347	482	481	458
1944	265	343	410	473	473	370	0	670	470	216	334	401
1945	184	482	479	480	477	570	0	670	259	284	435	458
1946	213	370	678	470	456	473	0	670	192	400	416	439
1947	176	244	472	270	365	470	0	670	470	410	362	457
1948	184	255	326	448	470	552	-136	657	296	223	299	457
1949	152	223	291	231	202	470	0	441	470	470	329	420
1950	168	233	298	467	470	570	-73	652	470	192	267	459
1951	132	362	684	468	355	402	0	670	340	478	481	458
1952	462	412	466	467	470	369	0	670	336	482	481	478
1953	475	470	464	469	473	473	0	670	347	452	481	478
1954	206	469	469	469	381	555	0	670	340	427	458	458
1955	226	467	467	470	290	474	0	670	92	300	318	319
1956	132	182	463	344	414	587	0	670	349	482	481	477
1957	474	333	470	470	470	507	0	670	308	416	433	446
1958	466	492	468	465	464	469	0	670	408	482	480	478
1959	475	472	470	470	470	469	0	480	496	413	296	440
1960	169	244	315	413	444	370	0	670	470	411	245	375
1961	136	442	273	226	333	370	0	441	470	439	284	433
1962	178	243	308	169	276	455	-136	280	470	470	411	441
1963	471	470	475	467	469	471	0	670	237	400	421	458
1964	469	469	493	468	286	473	0	442	472	400	406	424
1965	158	469	440	470	168	448	0	670	349	398	428	458
1966	159	399	681	469	471	474	0	670	224	402	436	432
1967	164	406	471	472	270	570	0	670	295	424	481	478
1968	475	471	470	466	289	391	0	670	280	461	479	449
1969	211	290	471	471	442	516	0	670	325	482	481	478
1970	473	471	466	463	471	398	0	670	344	482	481	458
1971	473	471	481	470	472	472	0	670	347	401	454	458
1972	294	237	473	473	524	474	0	670	226	406	439	438
1973	265	474	356	447	467	471	0	670	308	471	481	458
1974	469	375	578	469	472	471	0	670	347	481	481	460
1975	491	472	468	472	465	469	0	670	349	463	480	478
1976	472	472	471	473	330	470	0	301	395	416	451	345
1977	11	119	182	228	157	270	-181	-27	-50	132	145	158
1978	5	129	470	156	170	470	0	470	470	470	470	406
1979	287	480	442	475	470	658	0	670	209	404	425	458
1980	183	481	270	689	382	472	0	670	342	481	481	458
1981	266	249	479	474	275	670	0	670	173	397	389	440
1982	180	482	470	304	550	467	0	670	357	482	481	476
1983	472	465	468	464	466	465	0	670	364	482	480	477
1984	474	466	465	471	471	465	0	670	304	465	481	458
1985	222	417	672	470	471	471	0	670	204	409	413	451
1986	180	254	480	482	477	529	-86	653	470	272	358	477
1987	210	284	364	474	474	370	0	670	423	304	385	435
1988	182	244	306	475	18	570	0	670	446	33	176	247
1989	124	171	157	114	-52	470	-162	655	470	384	338	444
1990	174	248	210	374	247	570	-80	150	106	32	28	67
1991	-66	-16	-21	-40	48	467	0	114	149	184	196	216
1992	107	152	142	100	176	470	0	623	470	433	218	302
1993	132	21	17	257	77	470	0	470	470	470	470	365
1994	207	282	350	477	475	470	0	287	231	399	451	438
1995	38	135	216	411	470	270	-114	634	470	470	533	658
1996	475	472	464	465	466	472	0	670	352	482	481	478
1997	273	468	464	462	472	474	0	670	345	446	480	458
1998	222	297	482	480	475	521	0	670	297	394	481	478
1999	475	470	464	469	473	400	0	670	347	482	481	478
2000	237	451	384	474	477	570	0	670	218	413	459	444
2001	191	272	342	475	476	570	0	670	249	190	284	404
2002	156	225	473	470	470	570	0	470	470	163	327	369
2003	137	471	471	470	281	473	0	670	110	295	295	433
Average	**247**	**329**	**397**	**414**	**343**	**470**	**-18**	**576**	**340**	**385**	**391**	**415**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-10:
CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(C) Alternative 3

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	30	-29	0	152	-131	12	11	8
1923	4	4	4	-17	1	5	0	161	-142	12	11	7
1924	7	7	6	4	3	-44	0	9	-100	-25	-52	-77
1925	-116	-113	-100	-108	-114	0	-162	-224	-433	370	370	5
1926	7	6	6	5	157	-109	0	1	-433	284	96	5
1927	4	4	370	370	369	-94	0	142	-137	12	11	8
1928	1	1	-2	0	1	0	0	-149	-375	547	11	8
1929	10	8	6	3	3	0	0	-222	-455	263	15	20
1930	13	9	-47	370	370	142	0	192	-173	-170	-85	-4
1931	-2	-1	-1	-1	-1	-76	-181	-170	-255	-197	-185	-168
1932	-168	-147	-133	370	240	244	0	570	370	125	-174	-7
1933	-4	-3	-2	-1	-2	0	-42	113	-455	210	-7	-17
1934	-178	-156	-142	-137	173	0	0	-222	-455	370	4	8
1935	4	-129	-145	-137	209	282	-136	-226	370	370	432	15
1936	7	6	4	2	122	203	0	164	-175	-144	11	8
1937	-10	-7	-5	-3	-6	131	0	379	-173	-170	-94	8
1938	-20	-13	41	-11	-7	-1	0	144	-122	12	11	8
1939	4	2	0	-6	-7	0	0	0	-233	302	-14	-17
1940	-14	-11	-7	-5	-10	441	-117	239	-173	-170	-112	8
1941	-39	-28	-20	-7	-5	160	0	117	-172	12	11	8
1942	4	1	-15	6	0	2	0	133	-115	12	11	8
1943	4	-1	-2	-4	0	1	0	144	-123	12	11	8
1944	-33	-24	-12	-8	-10	278	0	255	-174	-170	-45	-2
1945	-37	-33	-32	-28	-27	-192	0	570	32	-170	-35	8
1946	-40	44	-5	0	-102	96	0	168	-146	12	11	8
1947	-32	-28	-21	-16	-11	0	0	570	-433	277	-61	-55
1948	-31	-26	-13	-16	-327	452	-136	437	-174	-170	-112	8
1949	-54	-39	-28	-13	-16	0	0	151	370	-50	-50	-44
1950	-39	-31	-22	-14	370	48	-73	149	-173	-170	-112	8
1951	-56	58	-5	-2	0	3	0	151	-130	12	11	8
1952	-53	-40	-21	-34	269	-101	0	143	-134	12	11	8
1953	5	0	-6	-1	3	3	0	142	-123	12	11	8
1954	5	1	-26	-11	40	1	0	-149	-24	207	11	8
1955	-37	-27	-28	190	-203	87	0	151	-428	298	11	-50
1956	-31	-24	-21	0	213	-73	0	140	-121	12	11	7
1957	4	2	-1	-8	-10	53	0	144	-162	12	11	8
1958	-51	58	-2	-5	-7	-1	0	81	-62	12	10	8
1959	5	2	-20	-7	-7	-177	0	180	-395	447	11	5
1960	-24	-18	-9	-10	-33	298	0	151	-433	309	-85	-48
1961	-26	-21	-13	-13	-12	360	0	151	-433	339	46	-58
1962	-29	-23	-16	-137	-100	-92	-136	-20	-71	370	149	-46
1963	-30	113	-198	-3	-1	1	0	129	-111	12	11	8
1964	-38	-26	67	-2	3	3	0	151	-129	12	9	-35
1965	-37	-28	-22	262	-148	3	0	-149	178	12	10	8
1966	-34	38	-3	-1	1	4	0	169	-147	12	11	-38
1967	-28	-23	-12	-23	304	-25	0	125	-175	-46	11	8
1968	5	1	0	-4	0	2	0	168	-394	251	9	8
1969	-33	-25	-21	-25	247	-106	0	145	-145	12	11	8
1970	3	1	-4	-7	1	3	0	149	-126	12	11	8
1971	-34	-15	44	0	-93	88	0	144	-123	12	11	8
1972	5	-5	-17	-16	41	4	0	168	-394	251	11	7
1973	-22	-26	59	-23	-3	1	0	154	-131	12	11	8
1974	-34	35	-3	-1	2	1	0	143	-123	11	11	-9
1975	20	2	-2	-16	15	-1	0	143	-121	12	10	8
1976	2	2	1	-13	-9	0	0	-222	-155	-37	-40	-138
1977	-187	-153	-147	-141	-161	-144	-181	-222	-255	-259	-258	-22
1978	0	0	0	-27	0	0	0	370	370	370	370	306
1979	400	1	1	1	370	328	0	167	-394	251	11	8
1980	5	4	-7	-6	-4	2	0	149	-128	11	11	8
1981	5	2	4	2	-10	0	0	193	-431	262	11	6
1982	4	4	215	-230	0	-3	0	132	-113	12	11	6
1983	2	-5	-2	-6	-4	-5	0	126	-106	12	10	7
1984	4	-4	-5	1	1	3	0	148	-125	12	11	8
1985	-7	6	-1	0	1	1	0	194	-173	12	11	-13
1986	-8	-7	-5	-7	-5	429	-86	200	-173	-170	-112	7
1987	5	2	-6	-3	-4	102	0	-199	-433	369	54	-20
1988	-12	-9	-7	-4	-327	-244	0	570	-455	356	0	-8
1989	-4	-2	-2	-2	-114	0	-162	-214	370	284	60	-13
1990	-8	-6	-111	-109	0	470	-80	-7	-255	-188	-200	-178
1991	-175	-153	-152	-140	-161	-133	-181	-52	-18	-219	-222	-209
1992	-95	0	0	0	-1	0	0	523	370	333	0	26
1993	7	-147	-133	-111	-63	0	-121	370	370	370	370	19
1994	5	8	6	4	3	-144	0	0	-255	0	21	-14
1995	-148	-127	-109	-63	370	259	-114	534	370	303	-111	8
1996	5	2	-6	-5	-4	2	0	137	-118	12	11	8
1997	4	-2	-6	-8	2	4	0	147	-125	12	10	8
1998	6	4	3	2	1	121	0	128	-173	-76	11	8
1999	5	0	-6	-1	3	3	0	142	-123	12	11	8
2000	5	1	-1	0	-1	55	0	151	-418	237	10	8
2001	-1	0	-40	0	0	315	0	191	-433	79	-67	-8
2002	-5	-4	-2	0	-332	470	0	244	-174	-171	4	-1
2003	-14	-14	-10	166	-265	121	0	140	-121	12	10	8
Average	**-18**	**-16**	**-14**	**0**	**15**	**52**	**-23**	**130**	**-153**	**78**	**3**	**-6**

NOTE: Values with a grey background indicate months of Delta excess conditions.

TABLE C4-10: CHANGES IN CCWD + LV DIVERSIONS (CFS), 2005 LOD, MODERATE FISHERY RESTRICTIONS

(D) Alternative 4

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	0	-1	0	0	10	4	4	3
1923	2	2	2	-9	1	2	0	0	9	4	4	3
1924	4	4	4	3	2	3	0	6	8	-28	-56	-82
1925	-121	-117	-104	-111	-118	0	-162	-25	0	0	0	4
1926	5	4	4	3	0	0	0	1	0	0	0	6
1927	4	4	0	0	0	0	0	0	38	182	184	69
1928	11	46	203	150	0	0	0	0	10	4	4	3
1929	10	8	6	3	3	0	0	0	0	0	16	20
1930	13	10	-47	0	0	0	0	0	0	0	0	9
1931	6	5	3	3	3	-70	-181	-161	-198	-187	-147	0
1932	0	0	-6	0	0	0	0	0	0	0	0	5
1933	4	3	2	2	2	0	-42	-15	0	0	8	-7
1934	0	0	0	0	0	0	0	0	0	0	0	4
1935	2	-5	0	0	0	0	0	0	0	0	62	15
1936	4	3	2	1	0	0	0	0	-71	27	184	43
1937	6	4	3	2	3	0	0	0	0	0	79	113
1938	0	0	0	194	234	98	0	0	10	4	4	3
1939	1	1	0	1	1	0	0	0	0	0	17	5
1940	6	5	3	2	4	-29	-117	-17	-68	0	62	54
1941	-5	-4	-3	-1	-1	0	0	0	2	123	4	3
1942	1	0	-2	-1	0	1	0	0	8	4	4	3
1943	2	0	-1	-2	0	0	0	0	5	9	4	3
1944	-4	-3	-2	-1	-1	0	0	0	0	0	0	5
1945	-4	-3	-3	-3	-2	0	0	0	0	0	62	3
1946	-5	7	-2	0	1	1	0	0	10	4	4	3
1947	-4	-3	-3	-2	-1	0	0	0	0	0	0	-6
1948	-4	-3	-2	-2	0	-18	-136	-13	0	0	62	45
1949	-7	-5	-4	-2	-2	0	0	0	0	0	0	-5
1950	-7	-6	-4	-3	0	0	-73	-18	0	0	62	46
1951	-7	61	142	-1	0	1	0	0	10	4	4	3
1952	-6	-4	-3	-2	0	0	0	0	21	4	4	3
1953	2	0	-2	0	1	1	0	0	9	4	4	3
1954	2	0	-1	-1	3	1	0	0	-24	37	4	3
1955	-4	-3	-3	0	10	1	0	0	4	9	4	-4
1956	-3	-3	-2	0	0	13	0	0	9	4	4	3
1957	1	1	0	0	-1	0	0	0	10	4	4	3
1958	-4	6	-1	-2	-2	0	0	0	8	4	4	3
1959	2	1	-2	-1	-1	4	0	0	10	4	4	2
1960	-5	-4	-2	-2	-28	0	0	0	0	0	0	-8
1961	-5	-4	-2	-2	-2	0	0	0	0	0	0	-10
1962	-6	-5	-4	-121	-92	0	-136	-200	0	0	0	-13
1963	-10	0	5	219	214	102	0	0	62	137	4	3
1964	-4	-3	8	-1	1	1	0	0	2	12	4	-3
1965	-4	-3	-3	0	16	1	0	0	9	4	4	3
1966	-4	5	-1	0	0	2	0	0	10	4	4	-3
1967	-2	-2	-1	-2	0	0	0	0	0	22	4	3
1968	2	0	0	-1	0	1	0	0	10	4	3	3
1969	-3	-2	-2	-2	0	0	0	0	16	4	4	3
1970	1	0	-1	-3	0	1	0	0	10	4	4	3
1971	-5	-1	4	0	1	1	0	0	9	4	4	3
1972	2	0	-2	-2	5	2	0	0	10	4	4	3
1973	-3	-4	0	3	-1	0	0	0	10	4	4	3
1974	-5	5	-1	-1	1	0	0	0	9	4	4	-1
1975	5	1	-1	-2	1	0	0	0	10	4	4	3
1976	1	1	0	-2	-1	0	0	0	-5	-3	-2	-109
1977	-170	-134	-138	-130	-147	-119	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	16
1979	193	-1	-1	0	0	88	0	0	28	182	184	47
1980	12	11	0	219	-2	1	0	0	10	4	4	3
1981	11	-8	7	3	-13	0	0	0	1	13	4	18
1982	11	11	0	-40	0	-1	0	0	9	4	4	2
1983	1	-2	-1	-2	-2	-2	0	0	9	4	4	3
1984	2	-2	-2	0	0	1	0	0	10	4	4	3
1985	-1	0	0	0	0	0	0	0	1	13	4	-1
1986	0	0	0	0	0	0	-86	-17	0	0	62	60
1987	2	1	-2	-1	-2	0	0	0	0	19	4	-4
1988	-2	-2	-1	-1	0	0	0	0	0	0	0	1
1989	1	1	1	1	-112	0	-162	-15	0	0	0	-8
1990	-5	-4	-110	-107	0	0	-80	-7	-86	-182	-19	0
1991	0	0	0	0	0	0	0	-36	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	-6
1993	6	0	0	0	0	0	0	0	0	0	0	0
1994	-1	-1	-1	0	0	0	0	0	0	0	-2	5
1995	0	0	0	0	0	0	0	0	0	0	63	188
1996	193	197	209	137	-1	1	0	0	9	4	4	3
1997	1	-1	-2	-3	1	1	0	0	10	4	4	3
1998	5	4	2	2	1	0	0	0	0	-6	4	3
1999	2	0	-2	0	1	1	0	0	9	4	4	3
2000	2	0	0	0	0	0	0	0	0	12	4	3
2001	0	0	0	0	0	0	0	0	0	0	5	2
2002	2	2	1	0	0	0	0	0	0	0	15	0
2003	2	2	1	0	10	1	0	0	9	4	4	3
Average	**1**	**1**	**2**	**5**	**0**	**1**	**-14**	**-6**	**0**	**6**	**13**	**8**

NOTE: Values with a grey background indicate months of Delta excess conditions.

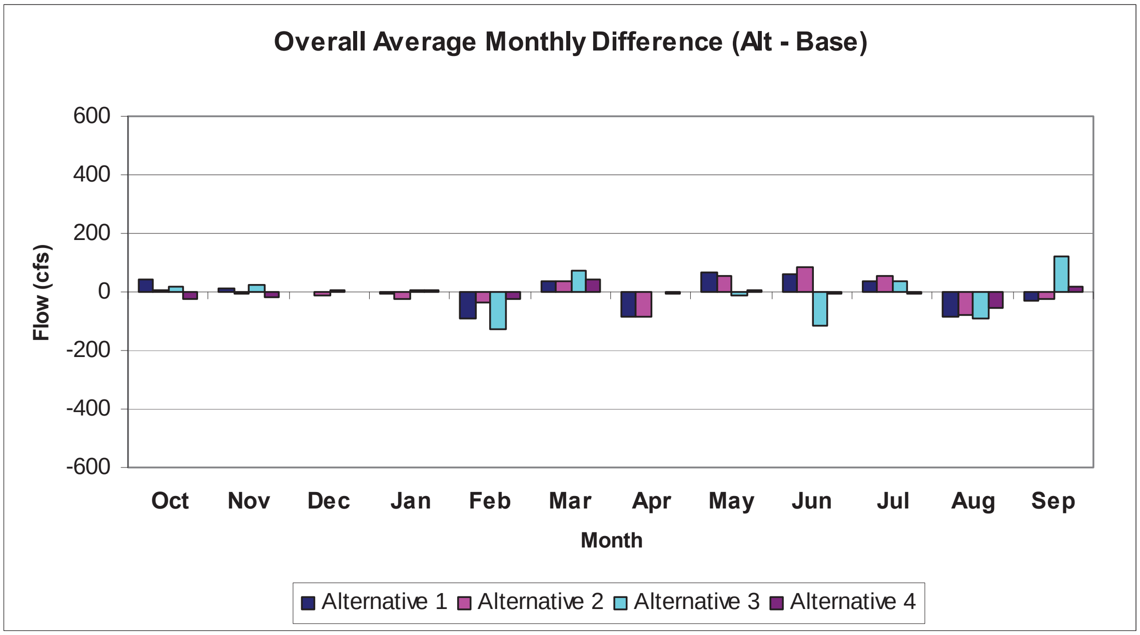

Figure C4-22: Changes in Average Monthly Sacramento River at Hood flow, 2005 LOD, Moderate Fishery Restrictions

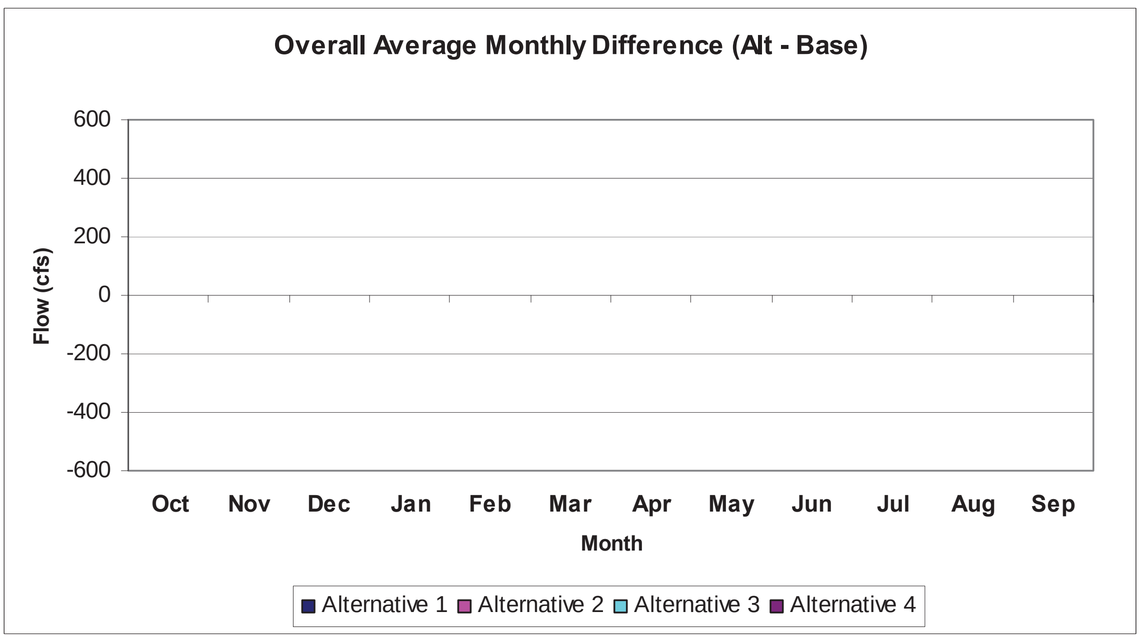

Figure C4-23: Changes in Average Monthly San Joaquin River at Vernalis Flow, 2005 LOD, Moderate Fishery Restrictions

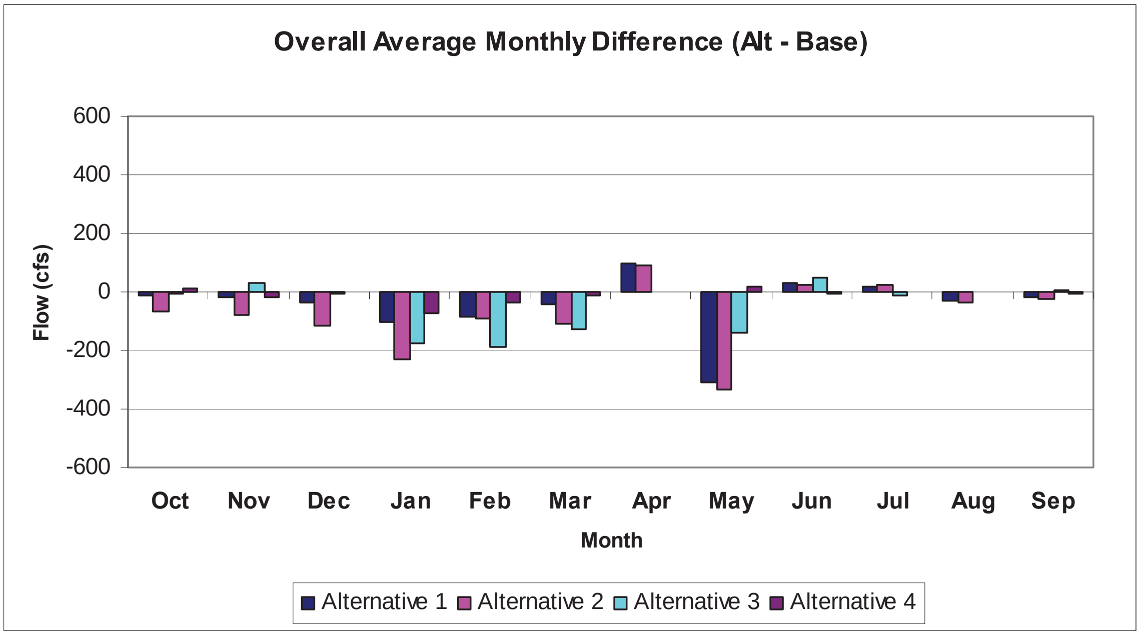

Figure C4-24: Changes in Average Monthly Delta Outflow, 2005 LOD, Moderate Fishery Restrictions

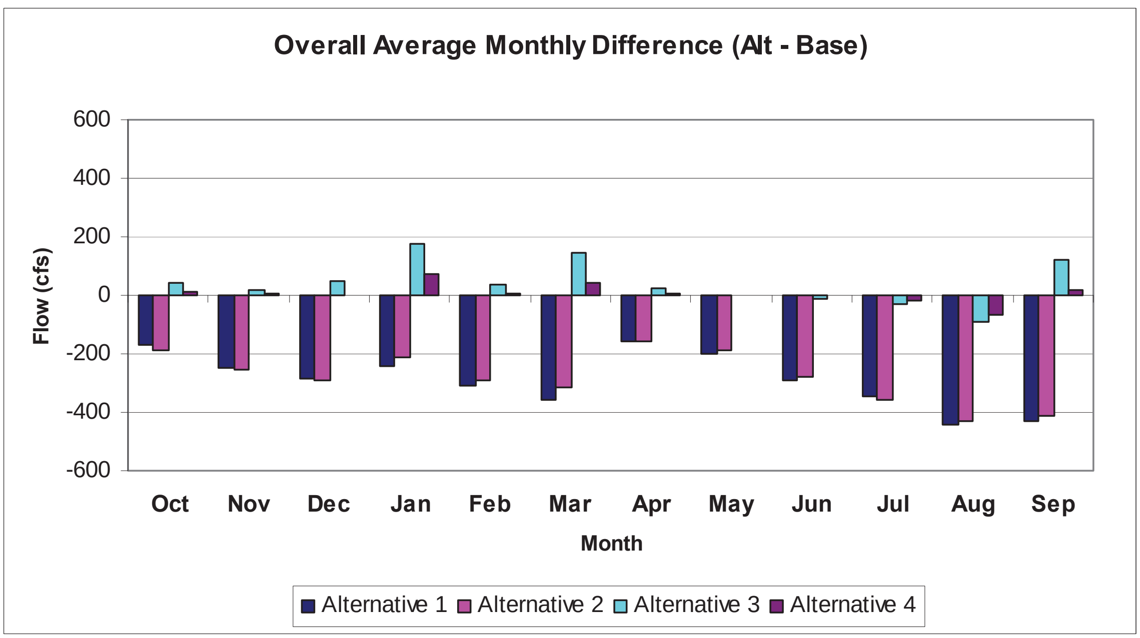

Figure C4-25: Changes in Average Monthly Banks + Jones Diversions, 2005 LOD, Moderate Fishery Restrictions

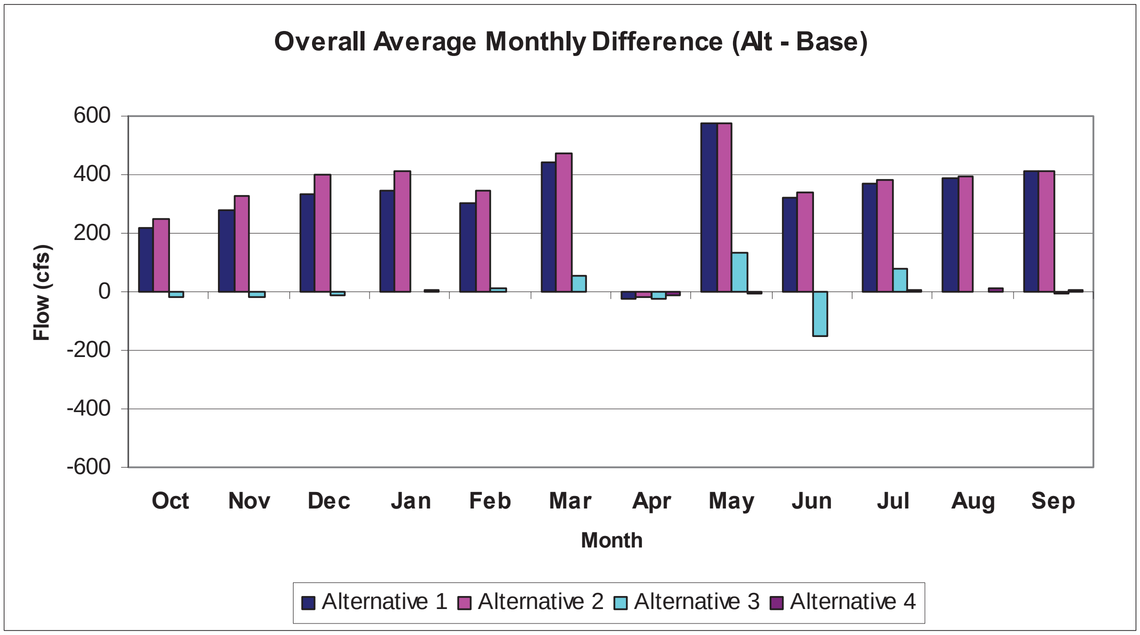

Figure C4-26: Changes in Average Monthly CCWD + LV Diversions, 2005 LOD, Moderate Fishery Restrictions

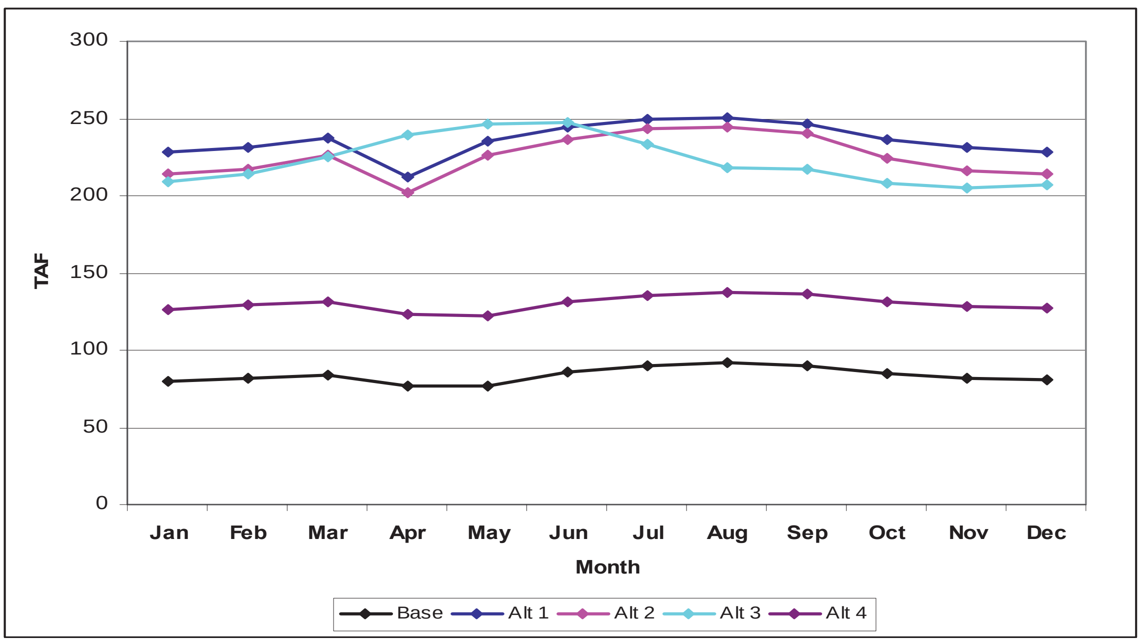

Figure C4-27: Monthly Average Los Vaqueros storage, 2005 LOD, Moderate Fishery Restrictions

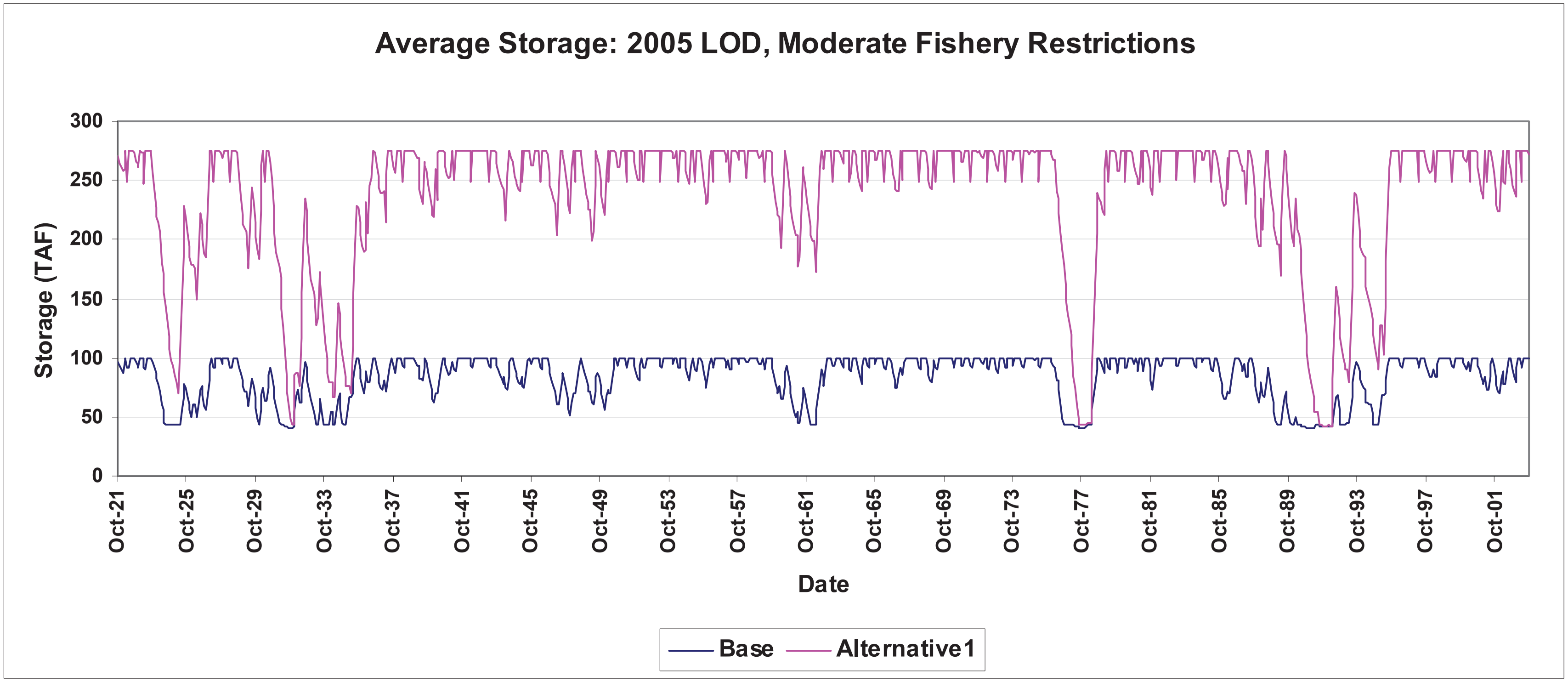

Figure C4-28: Timeseries of Alternative 1 and Base Los Vaqueros storage 2005 LOD, Moderate Fishery Restrictions

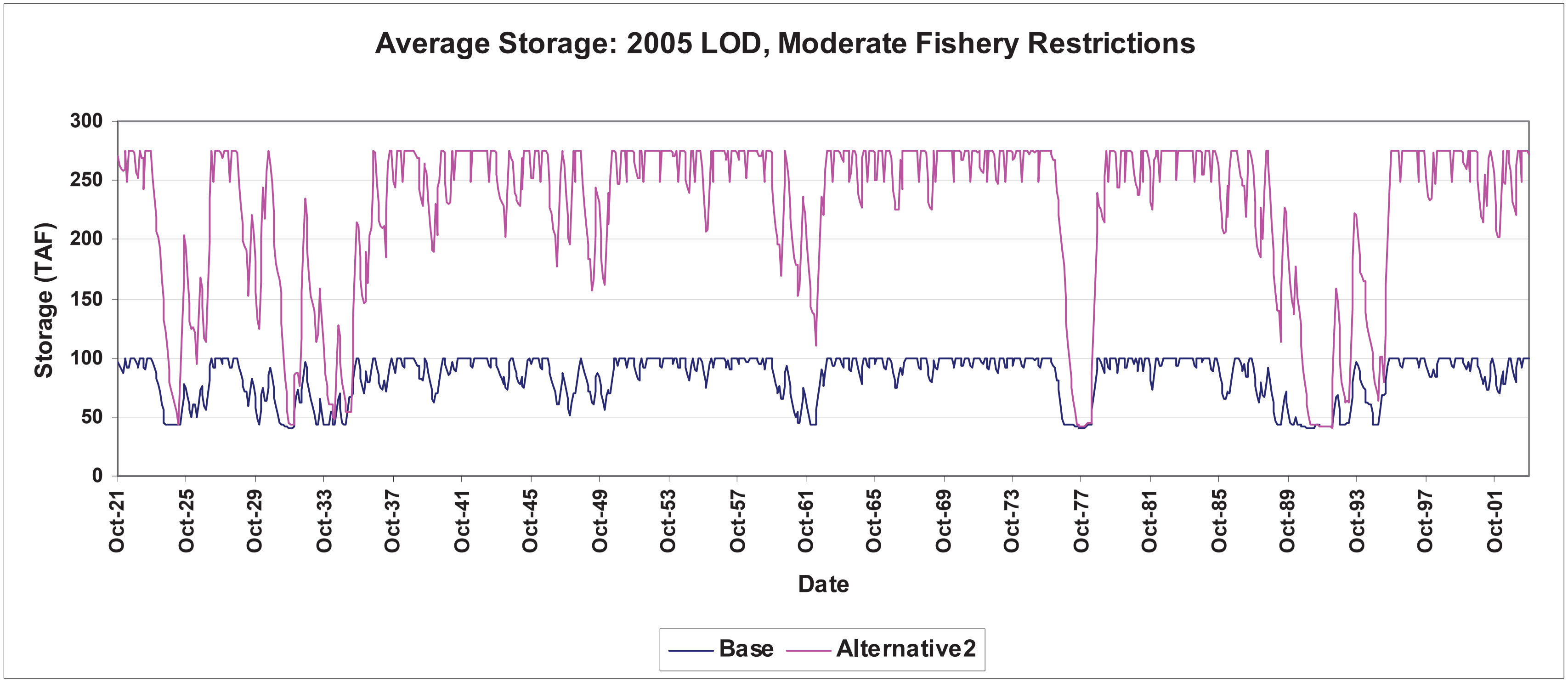

Figure C4-29: Timeseries of Alternative 2 and Base Los Vaqueros storage 2005 LOD, Moderate Fishery Restrictions

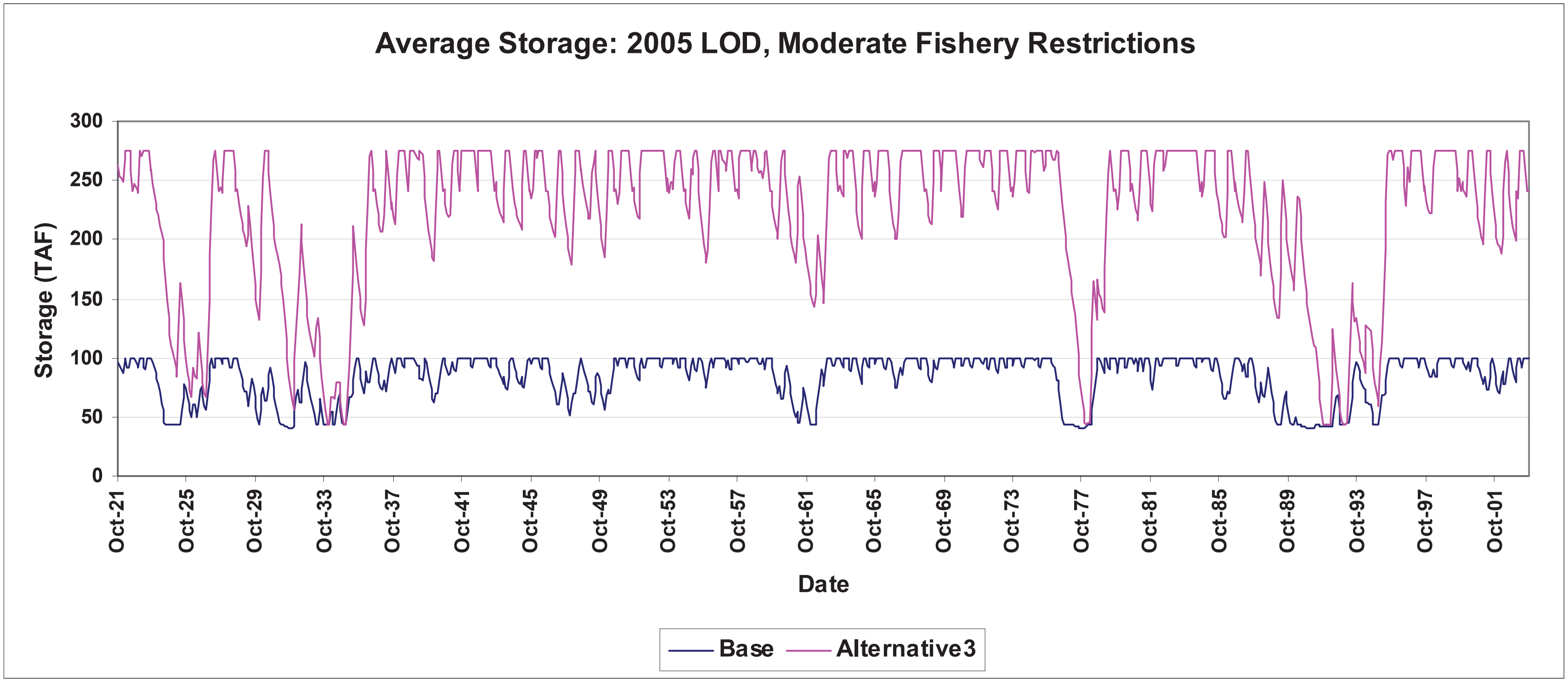

Figure C4-30: Timeseries of Alternative 3 and Base Los Vaqueros storage 2005 LOD, Moderate Fishery Restrictions

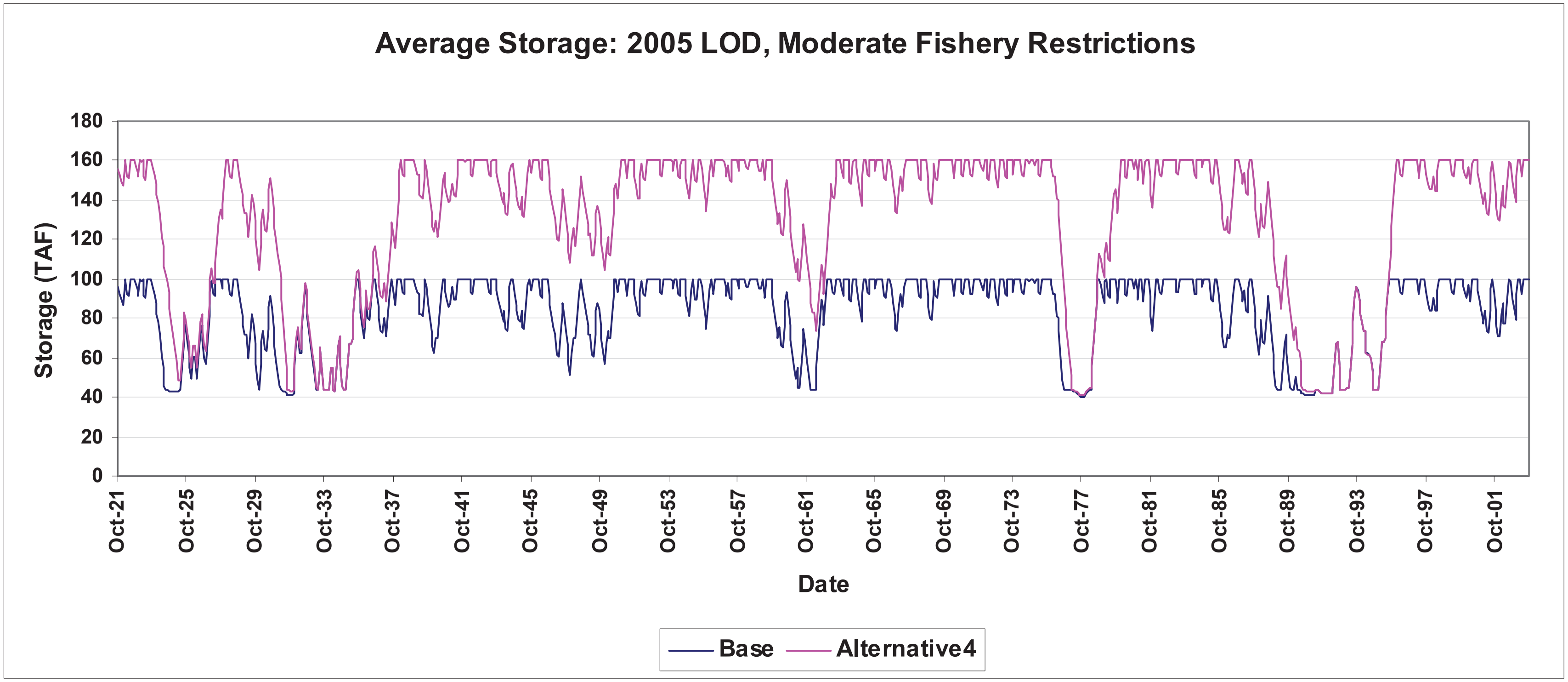

Figure C4-31: Timeseries of Alternative 4 and Base Los Vaqueros storage 2005 LOD, Moderate Fishery Restrictions

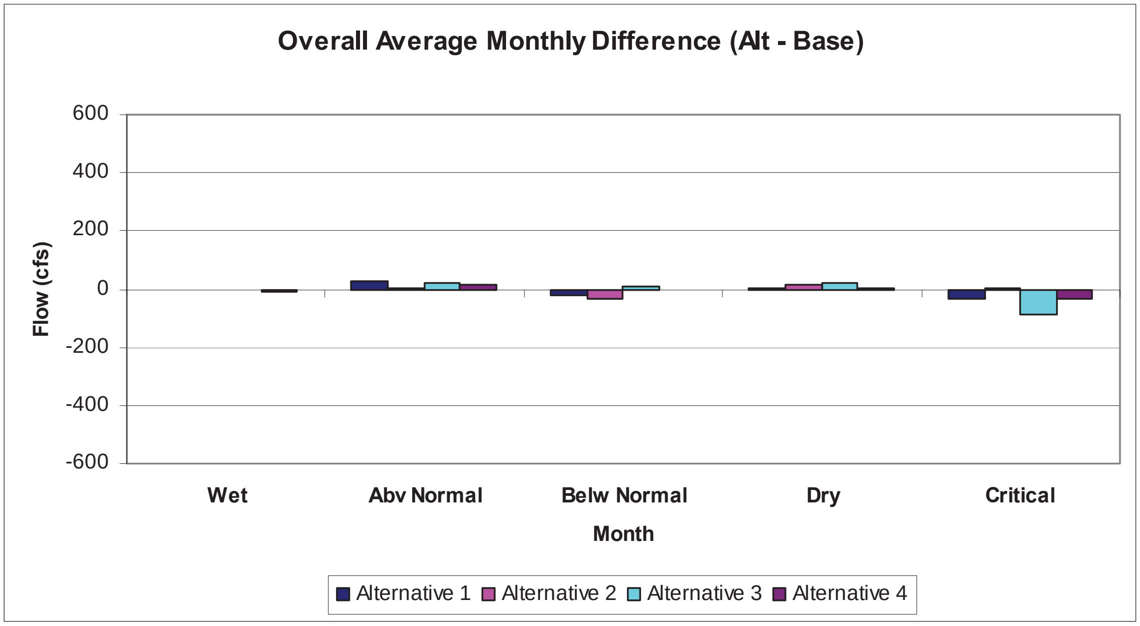

Figure C4-32: Changes in Sacramento River at Hood flow by water year type, 2005 LOD, Moderate Fishery Restrictions

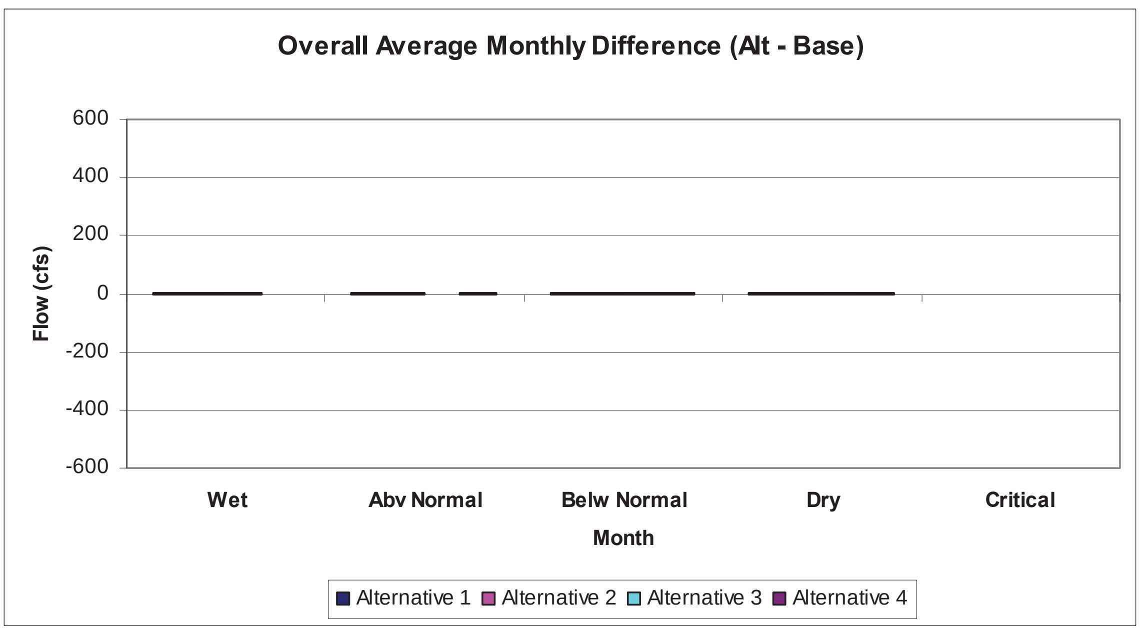

Figure C4-33: Changes in San Joaquin River at Vernalis flow by water year type, 2005 LOD, Moderate Fishery Restrictions

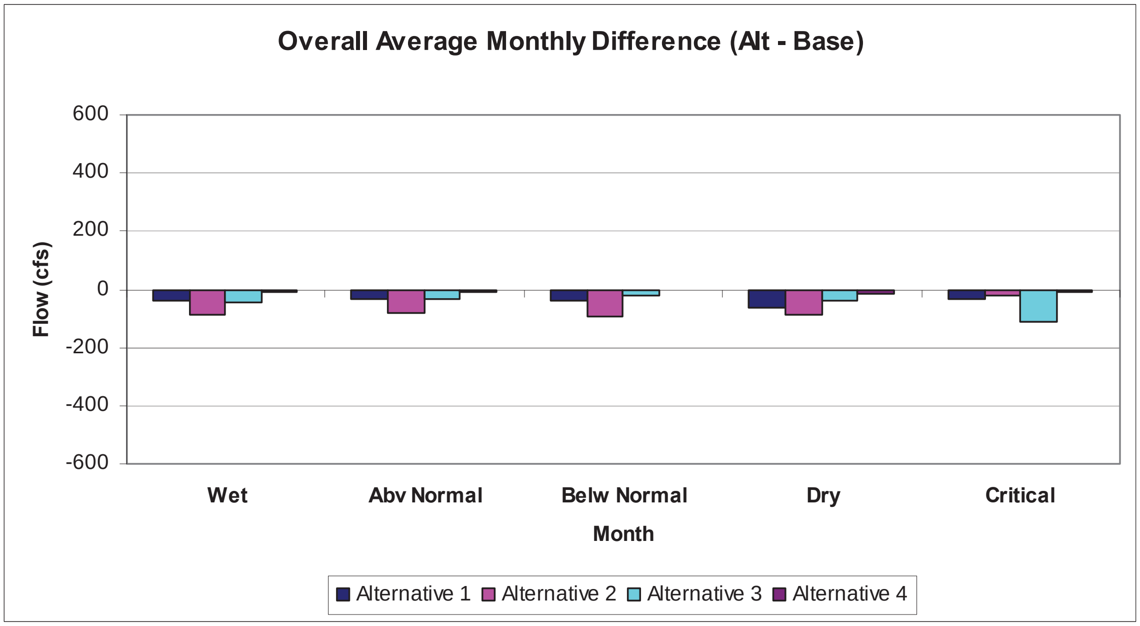

Figure C4-34: Changes in Delta Outflow by Year Type, 2005 LOD, Moderate Fishery Restrictions

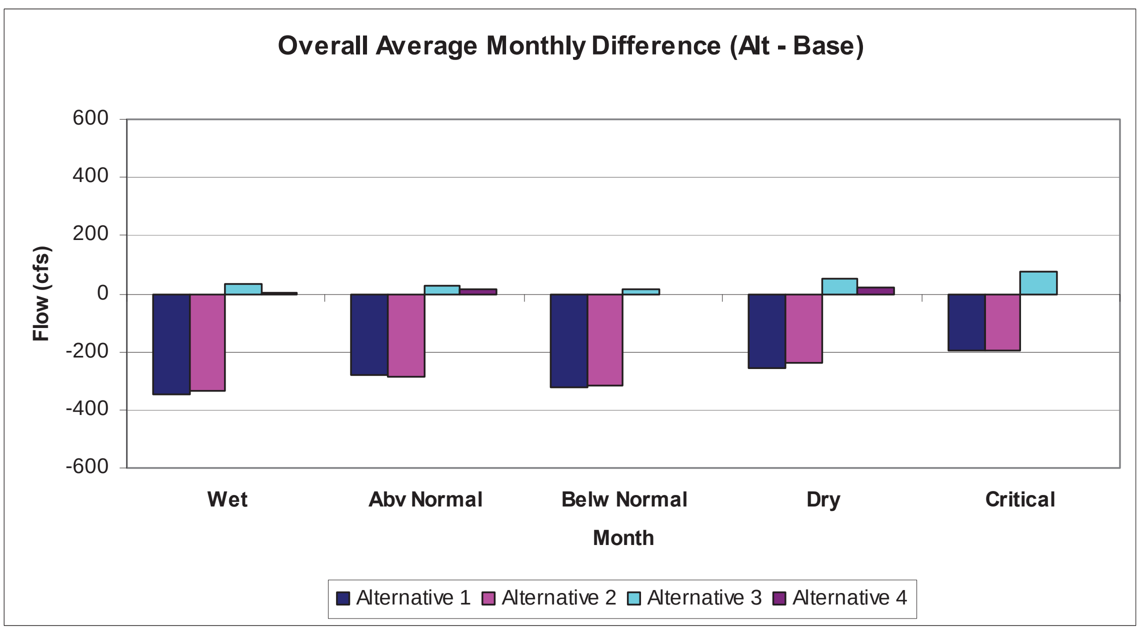

Figure C4-35: Changes in Banks + Jones Diversions by Year Type, 2005 LOD, Moderate Fishery Restrictions

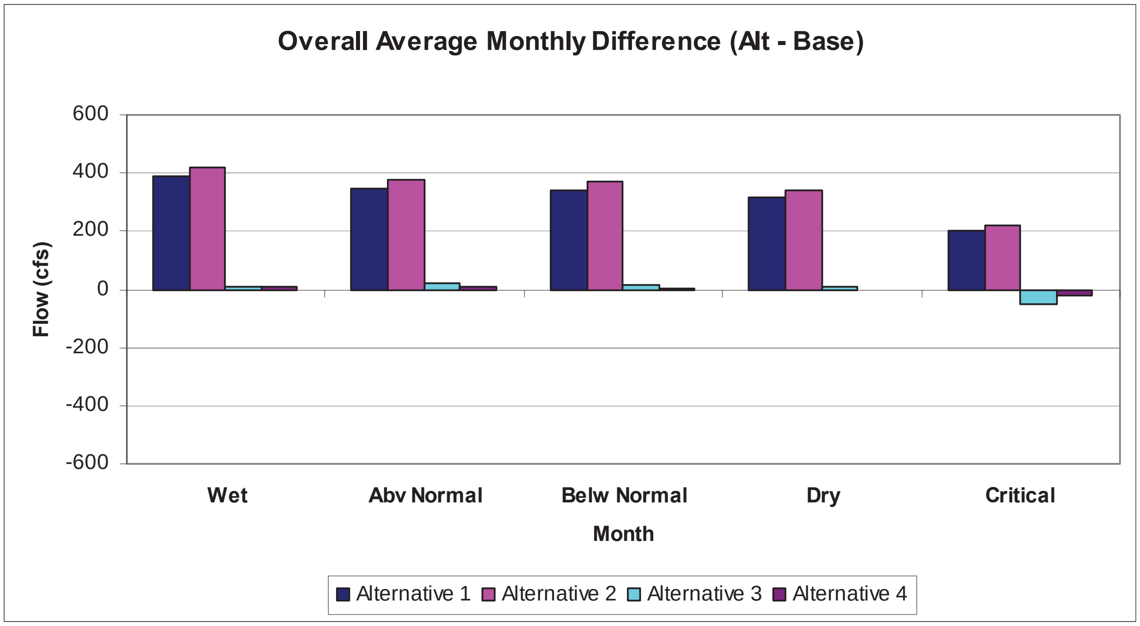

Figure C4-36: Changes in Project diversions by water year type, 2005 LOD, Moderate Fishery Restrictions

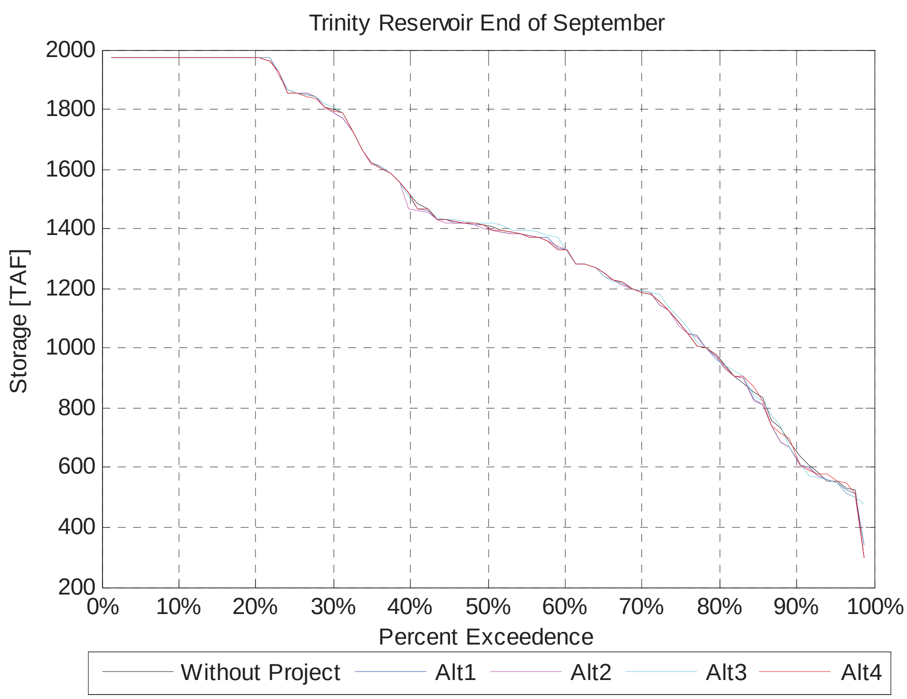

Figure C4-37: Trinity Reservoir end of September storage, 2005 LOD, Moderate Fishery Restrictions

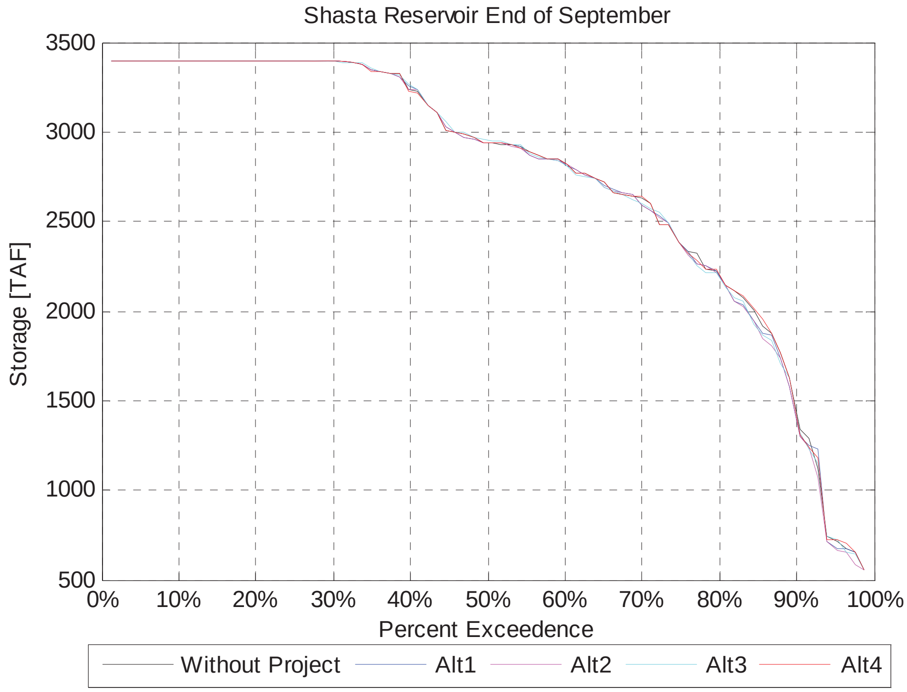

Figure C4-38: Shasta Reservoir end of September storage, 2005 LOD, Moderate Fishery Restrictions

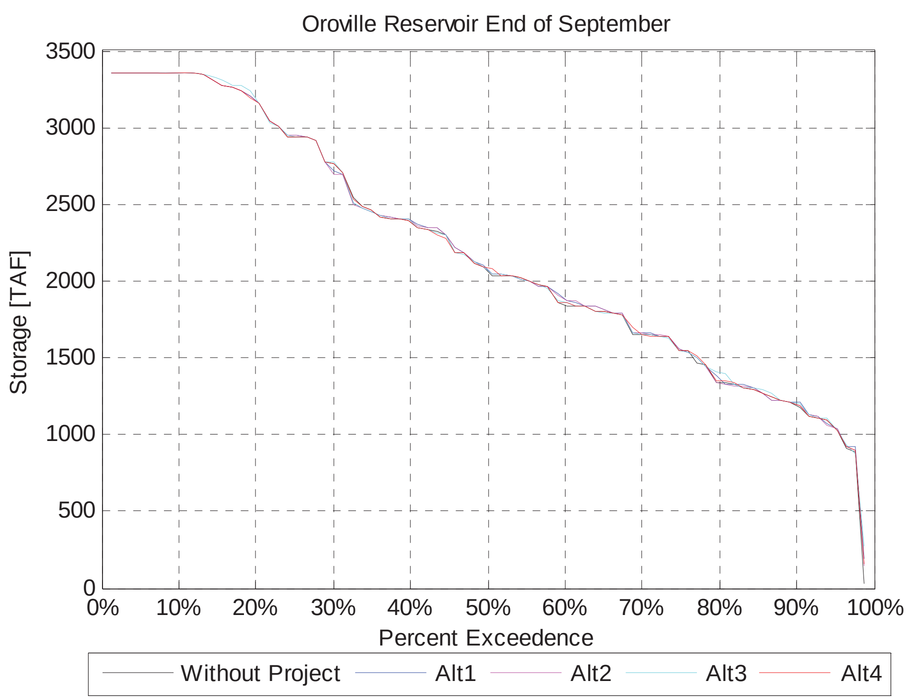

Figure C4-39: Oroville Reservoir end of September storage, 2005 LOD, Moderate Fishery Restrictions

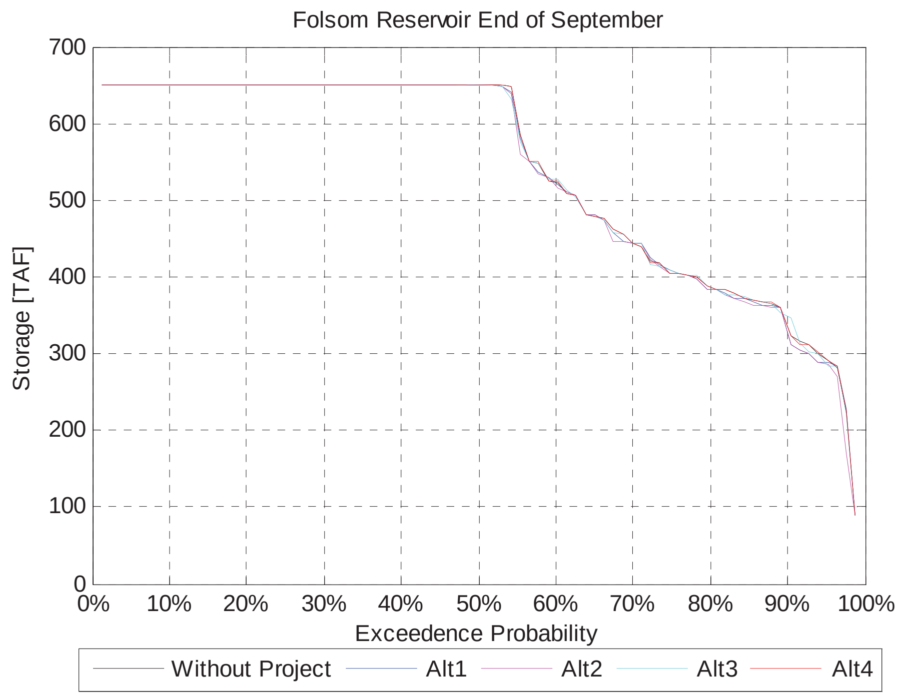

Figure C4-40: Folsom Reservoir end of September storage, 2005 LOD, Moderate Fishery Restrictions

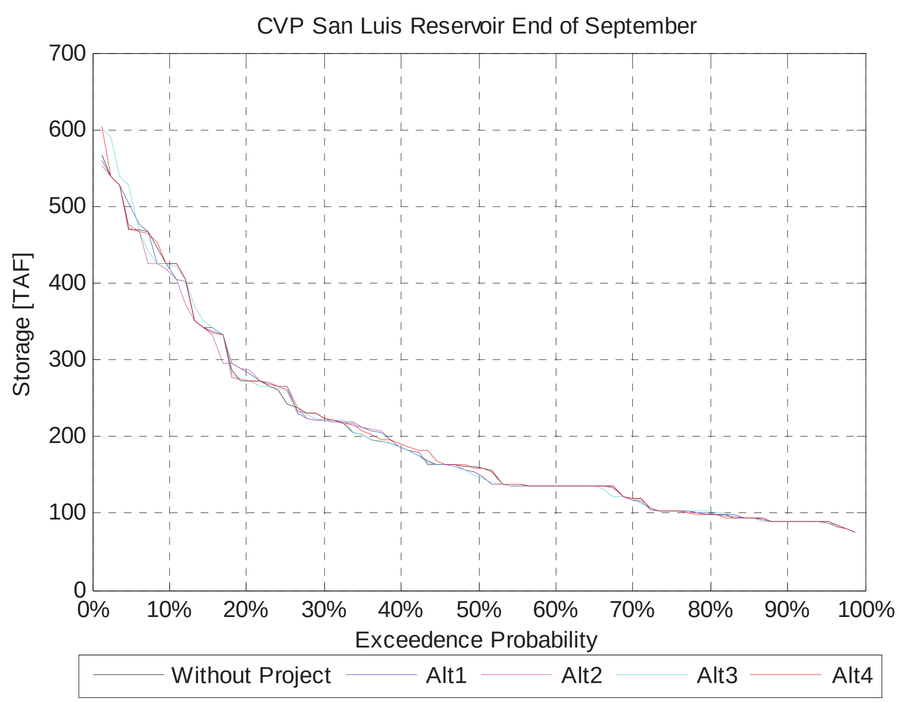

Figure C4-41: CVP San Luis Reservoir end of September storage, 2005 LOD, Moderate Fishery Restrictions

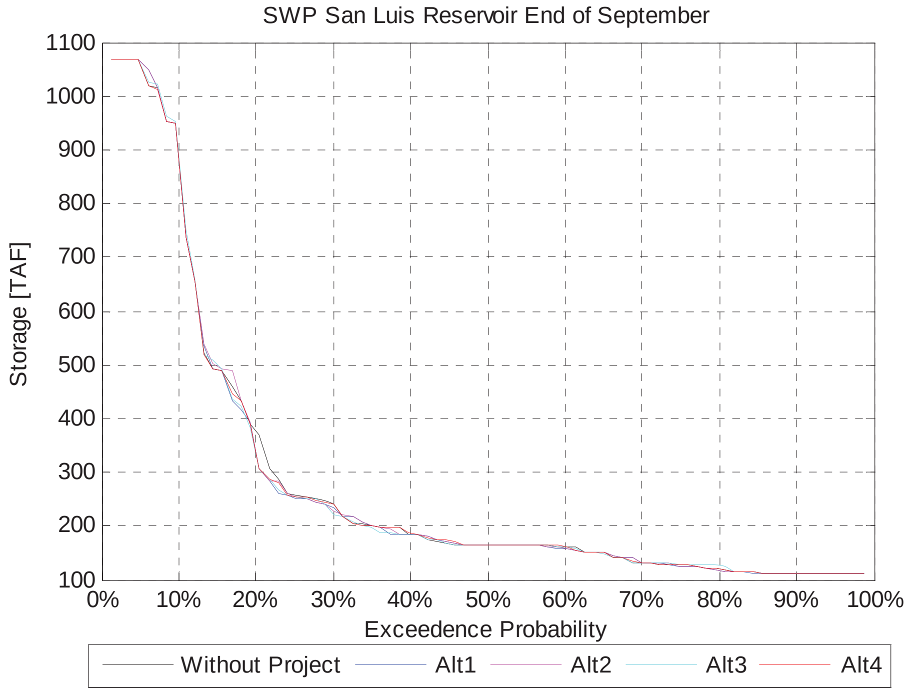

Figure C4-42: SWP San Luis Reservoir end of September storage, 2005 LOD, Moderate Fishery Restrictions