4.0 Cumulative Impacts

4.1 CEQA Requirements

Cumulative impacts are defined in the CEQA Guidelines (14 California Code of Regulations (CCR) 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 occurs from "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 future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time" (14 CCR Section 15355(b)).

Consistent with the CEQA Guidelines (14 CCR Section 15130(a)), the discussion of cumulative impacts in this section focuses on significant and potentially significant cumulative impacts. The CEQA Guidelines (14 CCR Section 15130(b)) provide the following guidance:

> *The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.*

4.2 Geographic Scope of Effects of the Proposed Program

The approach and geographic scope of the cumulative effects evaluation vary depending on the resource area being analyzed. Table 4.2-1 defines the geographic scope of the effects of the CVFPP for each of the resource topics addressed in this PEIR.

Table 4.2-1. Geographic Context for Cumulative Analysis

Resource Topic	Geographic Area
Aesthetics	Extended SPA and Sacramento and San Joaquin Valley watersheds
Agriculture and Forestry Resources	Extended SPA and Sacramento and San Joaquin Valley watersheds
Air Quality	Air basins within Extended SPA and Sacramento and San Joaquin Valley watersheds
Biological Resources—Aquatic	Waterways within Extended SPA and Sacramento and San Joaquin Valley watersheds
Biological Resources—Terrestrial	Extended SPA and Sacramento and San Joaquin Valley watersheds
Climate Change and Greenhouse Gas Emissions	Global
Cultural and Historic Resources	Extended SPA and Sacramento and San Joaquin Valley watersheds
Energy	Extended SPA and Sacramento and San Joaquin Valley watersheds
Geology, Soils, and Seismicity (Including Mineral and Paleontological Resources)	Extended SPA and Sacramento and San Joaquin Valley watersheds
Groundwater Resources	Sacramento River, San Joaquin Valley, and San Francisco Bay hydrologic regions and SoCal/coastal CVP/SWP service areas*
Hazards and Hazardous Materials	Extended SPA and Sacramento and San Joaquin Valley watersheds
Hydrology	Extended SPA and Sacramento and San Joaquin Valley watersheds
Land Use and Planning	Extended SPA and Sacramento and San Joaquin Valley watersheds
Noise	Extended SPA and Sacramento and San Joaquin Valley watersheds
Population, Employment, and Housing	Extended SPA and Sacramento and San Joaquin Valley watersheds
Public Services	Extended SPA and Sacramento and San Joaquin Valley watersheds

Table 4.2-1. Geographic Context for Cumulative Analysis (contd.)

Resource Topic	Geographic Area
Recreation	Extended SPA and Sacramento and San Joaquin Valley watersheds
Transportation and Traffic	Extended SPA
Utilities and Service Systems	Extended SPA and Sacramento and San Joaquin Valley watersheds
Water Quality	Extended SPA and Sacramento and San Joaquin Valley watersheds

Source: Data compiled by AECOM in 2011

Note:
* Because hydrologic regions cross the boundaries of the geographic areas in the study area, the discussion in the "Groundwater Resources" section is organized by hydrologic region rather than by the geographic areas of the study area. The SoCal/coastal CVP/SWP service areas are specifically addressed because of the potential for groundwater in those areas to be affected by flood management activities under the proposed program.

Key:
CVP = Central Valley Project
Extended SPA = extended systemwide planning area
SWP = State Water Project

4.3 Related Projects

4.3.1 Past and Present Projects and Activities and Cumulative Context

Many past and present projects and activities have occurred and are occurring in the study area. The effects of these past and present projects and activities have strongly influenced existing conditions, and some past projects are still affecting resources. Past and present projects and activities have contributed on a cumulative basis to the existing environment within the study area via various mechanisms, such as the following:

- Population growth and associated development of socioeconomic resources and infrastructure
- Conversion of natural vegetation to agricultural and developed land uses, and subsequent conversion or restoration of some agricultural lands to developed or natural lands
- Alteration of riverine hydrologic and geomorphic processes by flood management, water supply management, mining activities, and other activities
- Introduction of nonnative plant and animal species

Several major past and present projects are considered in the cumulative impact analysis. The list below focuses on major projects directly related to the CVFPP within the study area.

- Sacramento River Flood Control Project
- Sacramento River Bank Protection Project
- Shasta Dam and operations
- Red Bluff Diversion Dam and operations
- Oroville Dam and operations
- Folsom Dam and operations
- Friant Dam and operations
- New Bullards Bar Dam and operations
- Natomas Levee Improvement Program
- Long-Term Management Strategy for Dredged Material in the Delta
- Red Bluff Diversion Dam Fish Passage Improvement Project
- American River Watershed (Folsom Dam Modifications) Joint Federal Project
- South Sacramento County Streams Group Project
- West Sacramento North Area Project Early Implementation Program (EIP)
- Merced County Streams Group Project
- Knights Landing Ridge Drainage District Levee Repair
- Freeport Regional Water Project
- Contra Costa Water District Middle River Intake and Pump Station
- Lower San Joaquin River and Tributaries Project
- Levee Repairs Program (funded by the Disaster Preparedness and Flood Prevention Bond Act of 2006)

- Feather River Levee Setback Project
- Bear River Setback Levee Project
- Long-Term Central Valley Project (CVP) and State Water Project (SWP) Operations Criteria and Plan
- Upper Yuba Project (Three Rivers Levee Improvement Program EIP)

4.3.2 Reasonably Foreseeable Future Projects

The CEQA Guidelines identify two basic methods for establishing the cumulative context in which a project is to be considered: using a list of past, present, and probable future projects (the "list approach") and using projections from an adopted local, regional, or statewide plan, or related planning document that describes or evaluates conditions contributing to the cumulative effect, or a certified EIR for such a planning document (the "plan approach"). For this cumulative impact analysis, the list approach and the plan approach have been combined in the analysis of cumulative impacts to generate the most reliable assessment of future conditions possible.

Plans Describing Conditions Contributing to Cumulative Effects

A number of statewide, regional, and local plans were considered in the CVFPP cumulative analysis. Plans included in the cumulative analysis provide or are based on projections or otherwise describe conditions that contribute to overall cumulative effects in the study area; some also provide requirements to avoid or substantially lessen a cumulative problem (as described in Section 15064(h)(3) of the CEQA Guidelines). Projections or descriptions of future conditions may have been derived from the adopted plan, its CEQA document, or related studies or regional modeling. The plans listed below relate, on a regional or statewide level, to issues such as air quality, transportation, habitat preservation, and water.

- *California Water Plan Update 2009* (DWR 2009)
- The *Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board: Central Valley Region, the Sacramento River Basin and San Joaquin River Basin* (Central Valley RWQCB 2009)
- The East Bay Municipal Utility District's *WSMP 2040: Water Supply Management Program 2040* (EBMUD 2009)
- The California Air Resources Board's *Climate Change Scoping Plan: A Framework for Change* (CARB 2008)

- *PM_{10} Implementation/Maintenance Plan and Redesignation Request for Sacramento County* (SMAQMD 2010)
- *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan* (EDCAQMD et al. 2008)
- The San Joaquin Valley Air Pollution Control District's *2007 Ozone Plan* (SJVAPCD 2007a)
- The San Joaquin Valley Air Pollution Control District's *Extreme Ozone Attainment Demonstration Plan* (SJVAPCD 2004)
- The San Joaquin Valley Air Pollution Control District's *2007 PM10 Maintenance Plan and Request for Redesignation* (SJVAPCD 2007b)
- The San Joaquin Valley Air Pollution Control District's *San Joaquin Valley 2008 PM2.5 Plan* (SJVAPCD 2008)
- *Raising the Roof: California Development Projections and Constraints, 1997–2020. Statewide Housing Plan Update* (HCD 2000)
- *California Transportation Plan 2025* (Caltrans 2006)
- *Butte County Regional Transportation Plan 2008–2035* (BCAG 2008)
- The Sacramento Area Council of Governments' *Metropolitan Transportation Plan/Sustainable Communities Strategy for 2035* (SACOG 2011)
- The San Joaquin Council of Governments' *2011 Regional Transportation Plan* (SJCOG 2011)
- The Stanislaus Council of Governments' *2011 Regional Transportation Plan* (STANCOG 2010)
- The Merced County Association of Governments' *2012 Regional Transportation Improvement Program* (MCAG 2011)
- *Madera County 2011 Regional Transportation Plan* (Madera County 2011)
- The Council of Fresno County Governments' *2011 Regional Transportation Plan* (Council of Fresno County Governments 2010)

- *Natomas Basin Habitat Conservation Plan* (City of Sacramento et al. 2003)
- *East Contra Costa County Habitat Conservation Plan/Natural Community Conservation Plan* (East Contra Costa County HCPA 2006)
- *San Joaquin County Multi-Species Habitat Conservation and Open Space Plan* (San Joaquin County 2000)
- *Bay Delta Conservation Plan* (Reclamation et al. 2012)
- The Delta Stewardship Council's *Delta Plan* (Delta Stewardship Council 2011)
- The Delta Protection Commission's *Land Use and Resource Management Plan for the Primary Zone of the Delta* (DPC 2010)
- The Delta Protection Commission's *Economic Sustainability Plan for the Sacramento–San Joaquin Delta* (DPC 2011)
- The Sacramento–San Joaquin Delta Conservancy's *Interim Strategic Plan* (Delta Conservancy 2011)
- *Yolo Natural Heritage Program Plan Document* (Yolo County HCP/NCCP JPA 2011)
- *Butte Regional Conservation Plan* (BCAG 2011)

Also, in July 2000, a final programmatic environmental impact statement/ environmental impact report was prepared for the CALFED Bay-Delta Program (CALFED FEIS/R). The CALFED FEIS/R addresses a broad range of ecosystem quality, water supply, water quality, and levee system integrity issues, with a focus on the San Francisco Bay/Sacramento–San Joaquin Delta (Delta) system but also with broader consideration of upstream areas in the Sacramento and San Joaquin river drainages. The CALFED FEIS/R therefore reflects a broad cumulative assessment of potential projects and impacts in the Systemwide Planning Area (SPA), and has been incorporated by reference for this and other purposes. See Section 1.5, "Relationship to Other EIRs," in Chapter 1.0, "Introduction."

Impacts of the proposed program could also cumulate with those resulting from broad patterns of residential, commercial, industrial, institutional, and other developments within the SPA. Generally, these developments are governed by city and county general plans, specific plans, and zoning

ordinances, or other plans of specialized government entities such as the master plans prepared for campuses of California State University. These plans have generally been supported by environmental analysis under CEQA, typically in the form of PEIRs. Many of these plans and EIRs include measures to address program-level and cumulative impacts. However, these plans generally do not estimate specific development levels, but instead provide a broad framework to guide future development. Actual development levels will be strongly affected by factors such as population growth, the availability of government funds, future discretionary decisions, and the status of the economy. Further, given the broad geographic scope of the SPA, detailed consideration of each of these plan documents would be infeasible.

Instead, this PEIR relies on a geographic information system (GIS)–based assessment of the anticipated scope and nature of those future development levels and patterns. David Theobald of Colorado State University led compilation of a GIS database showing existing and projected future housing densities in the U.S. (Theobald 2005). This nationwide database can be used to focus on conditions in a particular state or region down to the level of Census Blocks (Census blocks are bounded by physical features or political boundaries, and range in size from a city block to several square miles in rural areas.). Information from this database for the program study area is shown in Figures 4.3-1a and 4.3-1b. The figures show housing density based on 2000 census data and projected future housing densities in 2020 based on the Spatially Explicit Regional Growth Model (SERGoM) developed by Mr. Theobald. This model estimates future housing density in particular areas based on projected population growth in local areas, local data on persons per household, travel time to the nearest urban core, locations of transportation corridors, and locations of protected lands where development would not be permitted. Housing density is expressed using five categories from greater to lesser density; Urban Suburban, Exurban, Rural, Undeveloped Private, and Public and/or Protected Land. Data from the 1990 and 2000 census' was entered into the model to assess its predictive accuracy, with good results. Housing density indicates the overall level of human influence and is associated with factors such as the extent of roads, demand for utilities and services, hydrologic alteration, habitat modification and fragmentation, and human disturbance. The projected future housing densities for 2020 are an indicator of future development projects that provide a context for the cumulative analysis. As shown in Figures 4.3-1a and 4.3-1b, future housing development would be greatest near existing urban development and along major transportation corridors.

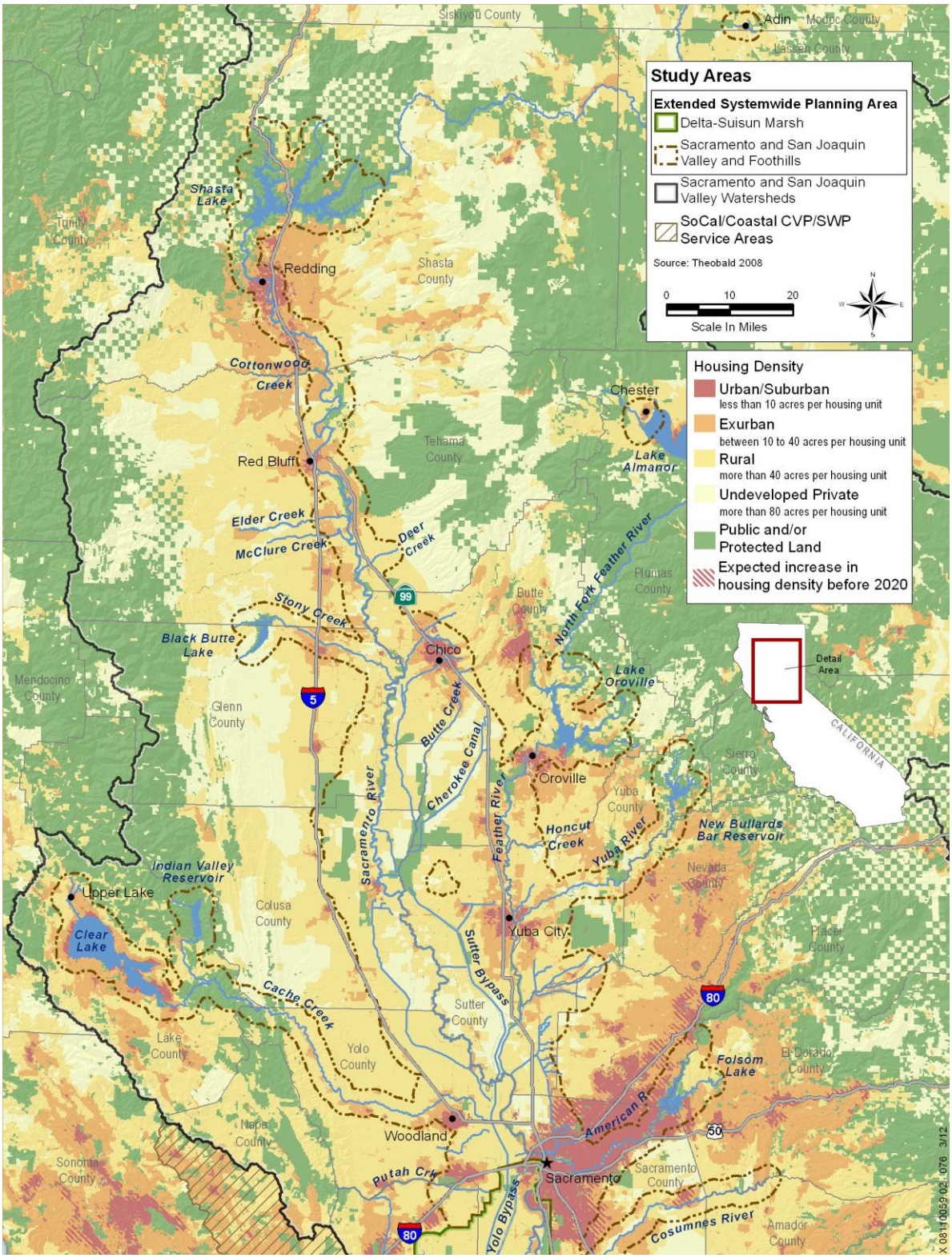

Figure 4.3-1a. Housing Density—North

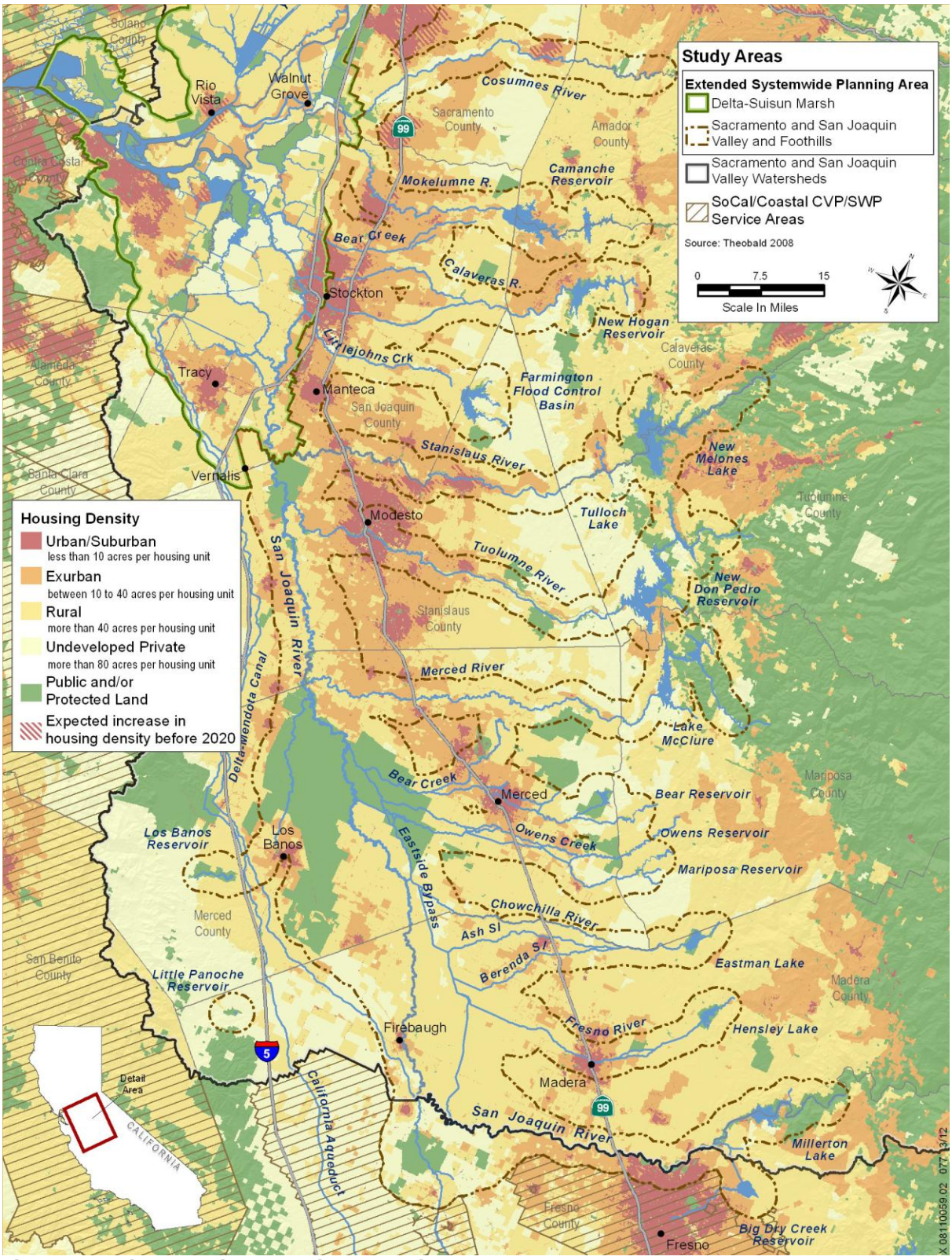

Figure 4.3-1b. Housing Density—South

List of Reasonably Foreseeable Probable Future Projects

In addition to the statewide, regional, and local plans and statewide development data identified in the previous section, reasonably foreseeable future flood management and water supply management projects in the extended systemwide planning area (Extended SPA) are included in this cumulative impacts analysis. These projects were considered individually because their effects are more closely related to those of the CVFPP than other projects. This list of projects does not include any project that would be included as part of the CVFPP if the CVFPP were adopted.

Each future project considered for this cumulative impacts analysis is located in the Extended SPA and could have an effect on a portion of the physical environment that also could be affected by the CVFPP (i.e., the project may interact with the CVFPP on a cumulative basis). A list of potential reasonably foreseeable future projects was developed using available information regarding planned projects (including agency Web sites).

Potential reasonably foreseeable future projects were evaluated for inclusion in the cumulative effects analysis based on three criteria. To be considered reasonably foreseeable and included in the cumulative impact analysis, the future project must generally meet all of the following criteria:

1. The project is related to the CVFPP; that is, it would affect CVFPP-affected resources (i.e., interact on a cumulative basis with the CVFPP).

2. Sufficiently detailed information about the project is available to allow meaningful analysis without undue speculation.

3. The project is actively under development (i.e., an identified sponsor is actively pursuing project development or construction); initial CEQA and/or National Environmental Policy Act (NEPA) compliance documents, such as a draft EIR or environmental impact statement, have been completed or substantial progress has been made toward completion; and the project is "reasonably foreseeable" given other considerations, such as site suitability, funding and economic viability, and regulatory limitations.

4. The project would not be considered to be part of the CVFPP if the CVFPP were adopted.

Projects that would be considered to be part of the CVFPP were not included in the list of future projects because environmental impacts of the CVFPP are already described in Chapter 3.0 of this PEIR. To consider the impacts of a project both on a project-specific basis and as a separate,

reasonably foreseeable future project would in effect "double count" the impacts.

Only projects meeting all four of the criteria described above were included in the analysis of cumulative impacts as reasonably foreseeable projects. The following projects have been considered:

- Yuba River Basin Project
- Shasta Lake Water Resources Investigation
- North of Delta Off-Stream Storage (Sites Reservoir)
- Los Vaqueros Reservoir Expansion
- Arroyo Pasajero Flood Related Improvements (CVP/SWP)
- San Joaquin River Salinity Management Plan
- Cosgrove Creek Flood Control Project
- San Joaquin River Restoration Program
- North Delta Flood Control and Ecosystem Restoration Project
- Dutch Slough Tidal Restoration Project
- Franks Tract Project
- Delta-Mendota Canal/California Aqueduct Intertie Project
- Delta Water Supply Project
- Hetch Hetchy Seismic Upgrade Project
- North Bay Aqueduct Alternative Intake Project
- BDCP/DHCCP/Delta Plan
- Suisun Marsh Management, Preservation, and Restoration Plan

4.4 Cumulative Impacts Methodology and Analysis

4.4.1 Methods and Assumptions

Determining the significance of a project's cumulative impacts is a two-step process. First, the extent of the cumulative impacts without the proposed program must be evaluated to determine whether a significant cumulative impact on a resource would exist in the future. To do so, a lead agency must examine the combined effects of past, present, and probable future projects to determine whether a significant cumulative impact would occur. Second, the lead agency must determine whether the project's incremental contribution to any significant cumulative impact is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

Consistent with Section 15064(h)(3) of the CEQA Guidelines, however, if a project would comply with an approved plan or mitigation program that provides specific requirements that would avoid or substantially lessen the significant cumulative impact, the project's incremental contribution to that significant cumulative impact might not be cumulatively considerable. In addition, as stated in Section 15064(h)(4) of the CEQA Guidelines, the existence of a significant cumulative impact caused by other projects alone shall not constitute substantial evidence that the incremental effects of a proposed project are cumulatively considerable.

For each issue area addressed in this PEIR, the criteria applied to evaluate the significance of the overall cumulative effect are the same criteria used to evaluate direct and indirect impacts for that issue area.

4.4.2 Cumulative Impacts

Aesthetics

Cumulative impacts on aesthetic resources would occur in the Extended SPA and, to a lesser extent, in the Sacramento and San Joaquin Valley watersheds; the aesthetic resources within these areas are described in detail in Section 3.2, "Aesthetics." The Sacramento and San Joaquin Valley and foothills consist of a band of rolling hills cut by steep-sided canyons at the base of the Sierra Nevada and Coast Ranges, transitioning to the relatively flat valley floor. The Delta is a vast, interconnected network of streams and rivers, with islands surrounded by levees and rural towns.

Urbanization occurs along the major highways within the Sacramento and San Joaquin Valley, primarily along Interstates 5 and 80 and State Routes 70 and 99. In the Delta, most of the urbanized development occurs on the periphery of this geographic area in Sacramento, San Joaquin, and Contra Costa counties. Development is increasingly changing the visual character of the study area from vast areas of open space to urban uses, thus altering and limiting the views available to recreationists and area residents. This trend will continue as reasonably foreseeable probable future projects are implemented in the study area. Visual conditions will continue to change substantially as agricultural lands and open space are replaced by urban and industrial development and infrastructure projects, and as vegetation is removed to make room for future development. As urban development increases, nighttime light and glare and the subsequent skyglow will also increase, and views of the night sky will become more limited. The effect on aesthetic resources that would result from these changes associated with past, present, and planned future projects would be a cumulatively significant impact.

The flood control facilities that are most visible in the study area are the levees located along the Sacramento and San Joaquin rivers and their tributaries and in the Delta. Numerous hydroelectric facilities operate at reservoirs in the foothills. These facilities consist of dams, penstocks, powerhouses, and high-voltage transmission lines and towers. The transmission lines are distributed throughout the Extended SPA, primarily in the Central Valley.

Overall, implementing conveyance-related near-term management activities (NTMAs) and long-term management activities (LTMAs) would not cause substantial, localized changes to the existing visual character of the Extended SPA. In urban settings, where the largest number of sensitive viewers would be expected, the existing levee system would typically be repaired, reconstructed, or otherwise improved in place. The conveyance-related NTMAs and LTMAs with the greatest potential to alter visual conditions (e.g., new facilities) would be implemented in rural areas where there are few sensitive viewers and flood control structures are common visual features, and the visual character of levees and other conveyance-related flood control facilities would generally be consistent with current conditions. Any new flood control facilities would generally be consistent in size and form with the existing structure; for example, a replacement pumping station built along the alignment of a setback levee would be similar to the existing pumping station along the levee segment to be removed. Therefore, implementing the proposed program's conveyance-related activities would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the

substantial degradation of scenic vistas, scenic resources, and existing visual character.

Increased drawdown resulting from changes in reservoir operations would lower water levels, which might cause a greater area of shoreline to be exposed, thereby reducing the visual character of the surrounding area. However, the additional drawdown associated with NTMAs would be comparable to existing seasonal variations, the fluctuations in reservoir water levels would not vary substantially from year to year, and the fluctuations would cause relatively minor changes in surface water elevations. Therefore, implementing the proposed program's storage-related activities would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation of scenic vistas, scenic resources, and existing visual character.

NTMAs and LTMAs could involve constructing small additional facilities such as pumping stations that could include lighting and building materials that could cause glare. Introducing new long-term or permanent sources of light and glare in areas where artificial lighting is currently limited or nonexistent could adversely affect daytime or nighttime views. Implementing a lighting plan and requiring conformance with lighting standards (Mitigation Measure VIS-4 (NTMA and LTMA)) would reduce this potentially significant impact to a less-than-significant level. These types of light and glare impacts occur over a limited area. It would be highly unlikely that NTMA and LTMA projects would generate light and glare of sufficient intensity to interact with light and glare generated by other projects in a manner that would result in a significant cumulative impact. Therefore, the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to new sources of substantial light and glare.

Other NTMAs and LTMAs would include implementation of a vegetation management strategy (VMS). As part of this strategy, levee-maintaining agencies would implement a vegetation life-cycle management plan that would result in gradual thinning or removal of mature riparian vegetation in some areas. The loss of trees and woody vegetation that would result from implementing other NTMAs and LTMAs would not substantially adversely affect the visual character. Many of the other management activities would occur in rural areas where there would be few sensitive viewers. In addition, sensitive viewers would gradually become accustomed to changes in the visual character; the loss of trees and woody vegetation would occur slowly over multiple decades, one tree at a time, and vegetation would be replaced in many locations with implementation of the VMS and conservation elements. Therefore, implementing the proposed program's

other management activities would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the substantial degradation of scenic vistas, scenic resources, and existing visual character.

Agriculture and Forestry Resources

Cumulative impacts on agriculture and forestry resources would occur in the Extended SPA and, to a lesser extent, in the Sacramento and San Joaquin Valley watersheds. Section 3.3, "Agriculture and Forestry Resources," describes agricultural land uses in the study area, as well as riparian forest as it relates to potential conversion of forest land to nonforest uses. A detailed description of riparian forest habitat is presented in Section 3.6, "Biological Resources—Terrestrial."

Without implementation of the CVFPP, the significant cumulative losses of agricultural resources, including Important Farmland (Prime Farmland, Unique Farmland, or Farmland of Statewide Importance), and of forestry resources that have occurred in the Extended SPA from past projects—and that would continue as a result of planned future projects in the study area—are considered a cumulatively considerable (i.e., significant) impact.

Agricultural Resources In 2008, the California Department of Conservation estimated that California had approximately 31.6 million acres of agricultural land, identifying approximately 12.4 million acres as Important Farmland and 19.2 million acres as Grazing Land. During the 12 biennial reporting cycles since the Farmland Mapping and Monitoring Program was established, more than 1.3 million acres of agricultural land in California have been converted to nonagricultural purposes. Urbanization has resulted in substantial loss of agricultural land in the state. Housing developments are the most frequent and largest category of newly urbanized land. The increase is associated mostly with single-family homes located at the periphery of existing cities, and to a lesser degree, with apartment complexes.

In addition to conversion to urban or other land uses (e.g., habitat restoration), other factors affect the acreage of irrigated farmland. Regionally, factors related to the availability and reliability of surface water and groundwater supplies, crop markets, and anticipation of urban development affect the acreage of irrigated farmland. More locally, changes in annual water supplies, drainage, access, and compatibility with adjacent land uses also affect the productivity and value, and thus use, of agricultural land.

Future implementation of development projects anticipated in city and county general plans and other flood control projects considered in this

cumulative analysis would further convert Important Farmland to nonagricultural uses. Often, conversions of Important Farmland, whether from past, present, or future projects, also result in conversions of land under Williamson Act contracts to uses inconsistent with the contracts and contract cancellations. Given these conditions, a significant cumulative impact exists relative to agricultural resources, without the contribution of impacts from the proposed program.

Construction activities associated with the proposed program would directly and indirectly affect lands classified as Important Farmland and lands under Williamson Act contracts. Construction-related activities would involve developing temporary facilities such as staging areas, access haul roads, and borrow sites. Implementing NTMAs and LTMAs could directly and permanently convert Important Farmland to nonagricultural uses—namely, flood control facilities. Where these activities would require modifying existing levee footprints or constructing new flood control facilities (i.e., new levees, weirs, or bypasses), they could also cause Williamson Act contracts to be cancelled.

Agricultural lands that are classified as Important Farmland or under Williamson Act contracts could be indirectly converted to nonagricultural uses where NTMAs and LTMAs would transect agricultural properties. If this were to occur, agricultural parcels could be fragmented, be reduced in size, or become irregularly shaped to such a degree as to make continuing agricultural land uses difficult or infeasible.

Other NTMAs and LTMAs may place agricultural lands in the expanded floodway, potentially rendering them no longer suitable for agricultural production (depending on factors such as crop type) because they would be inundated during high-water events. Regular inundation from placing the land in the expanded floodway may make agricultural production no longer feasible and the land could be converted to another use (e.g., habitat restoration). In addition, integrating environmental conservation elements into implementation actions may require agricultural land to support such actions, and implementing these elements would require that this land be converted to nonagricultural uses.

Operational changes to reservoir releases under NTMAs and LTMAs would result in only minor changes in downstream river flows. Flood flows would be comparable to the periodic flood flows that have occurred historically and would not be sufficient to alter the suitability of existing agricultural lands for continued agricultural production. The impact of converting Important Farmland to nonagricultural uses or cancelling Williamson Act contracts as a result of changes in the timing, magnitude, or frequency of flood releases under NTMAs and LTMAs would be less

than significant. The acreages of Important Farmland and land under Williamson Act contracts that may be directly and indirectly converted to nonagricultural uses from implementation of conveyance-related or other NTMAs and LTMAs cannot be quantified at this time; however, it is reasonable to assume that such conversions would occur during implementation of the CVFPP. Therefore, this impact would be significant. Implementing Mitigation Measures AG-1a (NTMA), AG-1b (NTMA), AG-1 (LTMA), AG-2a (LTMA), AG-2b (LTMA), and AG-3 (NTMA and LTMA) would preserve the agricultural productivity of Important Farmland to the extent possible and minimize impacts on Williamson Act–contracted lands. Implementing these mitigation measures would reduce impacts, but not to a less-than-significant level. For both NTMAs and LTMAs, impacts of conveyance-related and other management activities related to conversion of Important Farmland to nonagricultural uses and conversion of Williamson Act lands to uses inconsistent with the contracts would be significant and unavoidable.

Implementing Mitigation Measures AG-1a (NTMA), AG-1b (LTMA), AG-2a (LTMA), AG-2b (LTMA), and AG-3 (NTMA and LTMA) would substantially lessen the proposed program's incremental contribution to any significant cumulative impacts associated with conversion of Important Farmland and lands under Williamson Act contract. Continued agricultural land uses would be encouraged where possible and conservation easements would be acquired to replace agricultural lands converted to nonagricultural uses. These measures would lessen significant impacts associated with conversion of agricultural land uses because funding conservation easements would assist the public and private sectors in protecting other farmland from the pressures of development. However, the easements are often purchased for land that exhibits benefits to wildlife, including a combination of habitat, open space, and agricultural lands; therefore, the compensation provided by the fee contribution would not necessarily be applied exclusively to agricultural lands. In addition, it is likely that conservation easements would not provide new farmland and the productivity of existing farmland would not be improved as a result of the conservation easements. Consequently, full compensation for losses of farmland would not be achieved and a net loss of Important Farmland would still occur.

Given the size and geographic scope of the proposed program, and the inability to ensure full mitigation of impacts on agricultural resources to less-than-significant levels, the proposed program is considered to result in a cumulatively significant incremental contribution to the existing significant cumulative impact on agricultural resources.

Forestry Resources The following discussion focuses on riparian forest because this is the category of forestland expected to be the most affected by activities under the proposed program. Other types of forestland, such as oak woodland and conifer forest, could be affected by NTMAs and LTMAs; however, effects on these forestland types are less likely, and the extent of such effects would be less than effects on riparian forest. Past actions by humans have substantially changed riparian forest compared with historical conditions. Large areas of native riparian forest in the study area have been lost or degraded in the past 150 years. Most of these losses have resulted from constructing facilities for federal and State water projects and modifying flow patterns below dams, particularly through channelization, and then clearing or filling behind levees for the conversion to agricultural and urban land uses. These changes have resulted in overall significant cumulative adverse effects on the extent, species composition, and function of riparian forestlands. A detailed analysis of the potential cumulative effects of the proposed program on riparian forestlands is presented below under "Biological Resources—Terrestrial."

However, as identified in Section 3.3, "Agriculture and Forestry Resources," implementing conveyance-related and other NTMAs and LTMAs (i.e., implementing the VMS) would result in significant impacts related to the conversion of forestland to nonforest uses. Implementing Mitigation Measures AG-4 and AG-6 (NTMA and LTMA) would reduce these impacts to a less-than-significant level because the project proponent would replace lost forestland with equal amounts of forestland through habitat restoration, creation, or enhancement. With mitigation, conveyance-related and other activities under the proposed program would not result in a net reduction in the extent of riparian forest in the study area. Therefore, the proposed program's conveyance-related and other management activities would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to the conversion of forestland to nonforest uses.

Reoperating water storage facilities under the NTMAs and LTMAs may alter the frequency and duration of inundation of some patches of riparian vegetation. Surface water levels above and below existing dams would fluctuate if water storage facilities were reoperated. Although surface water levels could change from existing conditions at specific times of year, they would not be likely to vary substantially and would be expected to remain within historical fluctuation levels. These small changes in surface water levels would not result in the loss of riparian forest. Therefore, the proposed program's storage-related management activities would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to the conversion of forestland to nonforest uses.

It should be noted that ultimately, implementing the CVFPP Conservation Strategy Framework could result in a net increase in riparian forest in the program study area, which would assist in mitigating the cumulatively significant loss of riparian forest from past, present, and future projects.

Air Quality

Cumulative effects on air quality could occur at the local, regional, and state levels. Local and regional air districts are responsible for maintaining air quality within their jurisdictions to maintain and attain ambient air quality standards. The air quality plans and emissions inventories developed at the local and regional levels are incorporated into the State Implementation Plan, which demonstrates the State's ability to achieve and maintain ambient air quality standards. Therefore, significant emissions of a project or program that are not already included in the emissions inventories supporting those plans could affect local and regional efforts to achieve and maintain ambient air quality standards, which could in turn cumulatively contribute to impeding attainment of State air quality objectives.

The Extended SPA and the Sacramento and San Joaquin Valley watersheds are located in several air basins: the Sacramento Valley, Lake County, Mountain Counties, San Joaquin Valley, San Francisco Bay Area, Great Basin Valleys, and Northeast Plateau air basins. These air basins in the Extended SPA and the Sacramento and San Joaquin Valley watersheds are in nonattainment for various pollutants (see Figures 3.4-2 and 3.4-3 in Section 3.4, "Air Quality," for the attainment status of air basins in this area). The nonattainment status indicates that various past and present projects have combined to result in a significant adverse cumulative air quality impact for the nonattainment pollutant in the air basin. Revisions of the applicable air quality plans to address these nonattainment problems are regularly being prepared by the local air quality management districts for submission to the California Air Resources Board and the U.S. Environmental Protection Agency. However, the nonattainment problem in much of the Central Valley has proven challenging, particularly with regard to ozone and fine particulates, and this analysis assumes that the nonattainment situation will continue, resulting in a significant long-term cumulative impact.

The construction-related, operational, and maintenance-related activities associated with the NTMAs and LTMAs would generate project-specific emissions of criteria air pollutants, toxic air contaminants (TACs), and odors within the Extended SPA and Sacramento and San Joaquin Valley watersheds. The cumulative effects at the local, regional, and State levels are discussed in this section.

Because of the lack of available details about construction-related and operational activities under the proposed program, construction emissions associated with the proposed program were evaluated by comparing other similar construction projects that have occurred in the Extended SPA and the Sacramento and San Joaquin Valley watersheds with the applicable significance thresholds. These similar projects are the Reclamation District 17 Levee Improvement Project and the Feather River Levee Repair Project.

Short-Term Construction Impacts Construction under the proposed NTMAs and LTMAs would result in temporary emissions of reactive organic gases, oxides of nitrogen, carbon monoxide, oxides of sulfur, and respirable and fine particulate matter with aerodynamic resistance diameters of 10 and 2.5 micrometers or less (the latter commonly known as PM_{10} and $PM_{2.5}$). These emissions would occur intermittently and at varying intensities depending on the daily construction activities. The construction intensity required, locations of construction activities, and duration of construction are unknown for the proposed conveyance, storage, and other management actions; therefore, the emissions associated with these actions cannot be accurately quantified or compared with a threshold of significance at the time of this writing.

However, the example construction projects listed above, which are comparable to many of the proposed program's anticipated actions in terms of construction intensity and location, generated emissions that exceeded some of the applicable thresholds of significance. In addition, because the proposed program's management activities would occur in some of the same air districts as the example projects, the proposed program's construction emissions would be likely to exceed applicable significance thresholds. Although the program's construction emissions may be accounted for in the emissions inventories of the applicable air quality plans, those plans generally do not identify the projects assumed to contribute to overall inventory levels. Instead, the emissions inventories generally consist of broad categories, such as off-road motor vehicles, without further specification. The total construction emissions anticipated under the program are estimated to compose a small fraction of the overall emissions inventories in the applicable air quality plans. However, given the uncertainty regarding the scale of those emissions and the inability to determine whether those emissions have been accounted for in the plan inventories, this analysis conservatively assumes that program construction emissions could hamper maintenance or attainment of ambient air quality standards.

Some quantity of NTMA- and LTMA-related construction emissions in the same air district could be offset by flood avoidance benefits, but this offset cannot be assured to have a nexus to the identified impacts, either

temporally or geographically. Therefore, the overall incremental impact relative to existing conditions would be potentially significant, though only temporary in duration. Implementing Mitigation Measure AQ-1 (NTMA and LTMA) would reduce the impact of emissions from construction activities; however, the extent to which emissions would be reduced is unknown. Because of the uncertainty about proposed construction activities (duration, intensity, and location) and subsequent mitigation requirements, it is not possible at the time of this writing to know whether the emissions associated with constructing management actions would be reduced below the established thresholds. Consequently, construction-related impacts related to air pollutant emissions would be potentially significant and unavoidable, though only temporary in duration.

Assuming that all related projects would also implement all feasible construction emission control measures, construction emissions from some of the related projects may be less than significant; however, it is likely that at least some larger projects would result in potentially significant and unavoidable air quality impacts on their own. Because the proposed program would result in significant and unavoidable impacts related to emissions of nonattainment pollutants (e.g., ozone precursors, PM_{10}, and $PM_{2.5}$), the proposed program would be considered to result in a cumulatively considerable incremental contribution to a significant cumulative impact, though only temporary in duration.

The proposed program also has the potential to contribute to a cumulative localized air quality impact such as emissions of TACs, presence of naturally occurring asbestos (NOA), or emissions of odors. Construction of the proposed management activities would involve using heavy-duty diesel-fueled equipment that generate diesel particulate matter (diesel PM), which is classified as a TAC by the California Air Resources Board. It is anticipated that construction activities would be intermittent and temporary and would not occur over large geographic areas. Therefore, impacts associated with construction-related diesel PM emissions would be less than significant.

For a cumulative impact related to TAC emissions to be significant, an interaction must occur between the emission source and nearby exposed receptors. The situations in which numerous receptors might be exposed to diesel PM from multiple sources, thereby potentially generating a significant cumulative impact, could occur in urban settings. NTMAs and LTMAs would be relatively modest in urban settings, primarily involving repair, reconstruction, and improvement of existing levees and other flood control facilities. In these instances, construction would be short term and would be highly unlikely to make a cumulatively considerable incremental contribution to a significant cumulative impact related to diesel PM

exposure. Larger scale NTMAs and LTMAs with proportionately greater diesel PM emissions would be implemented in rural settings, where it is highly unlikely that there would be significant additional diesel PM emission sources near sensitive receptors. The diesel PM emissions from NTMAs and LTMAs would be less than significant on a project-specific basis, and the related projects would also not result in appreciable diesel PM exposure at the same sensitive receptors. Therefore, it is highly unlikely that a significant cumulative impact related to diesel PM would occur, and the proposed program would not make a cumulatively considerable incremental contribution to a significant cumulative impact related to diesel PM exposure.

NOA has been found in regions where the proposed program could potentially perform earth-disturbing activities. If soil containing NOA were to be disturbed during construction, construction employees and nearby sensitive receptors could be exposed to NOA. Implementing Mitigation Measure AQ-6 (NTMA and LTMA) would reduce this potentially significant impact to a less-than-significant level on a project-specific basis by requiring that all construction activities comply with the California Air Resources Board's Asbestos Air Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations, which was designed to minimize exposure of construction workers and nearby sensitive receptors to NOA. In addition, all of the related projects that would occur within areas known to have NOA would be required to comply with the same air toxic control measure and any other locally applicable requirements for NOA management. Therefore, a significant cumulative impact is not expected to occur, and the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to NOA.

Construction activities could also generate odor impacts from emissions of diesel exhaust. In large concentrations, diesel exhaust could cause a nuisance and odor impact. It is not anticipated that the proposed program's construction-related activities would individually generate odor impacts due to the intermittent activities and highly dispersive nature of diesel exhaust. Odor sources very seldom interact in an additive nature that results in a significant cumulative impact. Normally, there is a primary source of objectionable odors and attention focuses on this source. If another source of objectionable odors exists, it is often perceived as being a separate, less intense odor than the primary source, and not additive to the primary source. If a substantial number of sensitive receptors were already exposed to an objectionable source of odors, it is highly unlikely that the temporary and intermittent addition of diesel exhaust would be perceived as contributing substantially to the experience of objectionable odors in the area. In addition, diesel exhaust is highly dispersive; the odor rapidly

dissipates with distance. Any diesel exhaust odors generated by construction under the proposed program would not affect a substantial number of receptors. Therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to odors.

Long-Term Operational and Maintenance Impacts After construction of the proposed program's components, long-term operational emissions would be generated by operation and maintenance of program infrastructure. The net change to existing operational and maintenance-related activities from implementing NTMAs and many LTMAs is expected to be minimal; most activities would involve repairing, reconstructing, or improving the existing facilities, and then continuing the operations and maintenance practices already in place before the NTMAs or LTMAs were implemented. Alterations to operations of existing reservoirs included in the proposed program would have little effect on actual operation and maintenance efforts and associated emissions, because the modifications would only alter the timing of activities that already take place (e.g., initiating and terminating reservoir releases). Accordingly, these management activities would not emit a cumulatively considerable amount of criteria air pollutants or ozone precursors for which the applicable project region is nonattainment.

LTMAs could involve constructing and operating new facilities such as flood bypasses and levees. Operating and maintaining these facilities could potentially result in substantial new sources of emissions. The extent of emissions resulting from operation and maintenance of these facilities is highly dependent on factors such as the facility's location, size, and components. For example, the length of vehicle trips needed for maintenance staff to reach the facilities would influence total emissions. When anticipated emissions from LTMAs are combined with emissions from other reasonably foreseeable, probable future projects, it is possible that long-term operational emissions would exceed an applicable significance threshold established by an air district in the study area.

Operational activities would occur in the same nonattainment areas described above for construction; therefore, operational emissions could contribute to an increase in regional emissions that could conflict with the budget used for regional air quality planning. Although implementing Mitigation Measures AQ-3 (LTMA) and AQ-4 (LTMA) would reduce operational emissions, the extent of the reduction is unknown. Because of the uncertainty about proposed operational activities and subsequent mitigation requirements, it is not possible at the time of this writing to know whether the emissions associated with operating LTMAs would be reduced below the established thresholds. Consequently, until further

project-level analysis is completed, it is assumed that operation and maintenance of the LTMAs could interfere with the ability of the air districts to achieve or maintain ambient air quality standards. Therefore, operational emissions associated with LTMAs could result in a cumulatively considerable incremental contribution to a significant cumulative operational and maintenance-related air quality impact.

Operational and maintenance-related activities also have the potential to generate TACs and odors. Considering the minor potential for increases in operational and maintenance activities, low intensity of operational activities (i.e., stationary, mobile, and off-road), the large geographical area in which operational activities would occur, and the highly dispersive nature of diesel PM, operational and maintenance-related NTMAs and LTMAs are not anticipated to expose sensitive receptors to substantial concentrations of TACs. In addition, increases in operational and maintenance-related emissions would be associated primarily with new facilities (new bypasses, new levees), which would be located primarily in rural areas with few sensitive receptors and few opportunities for dispersal of TACs and odors between emission sources and receptors.

It is unlikely that the intermittent and low-intensity operational and maintenance-related activities associated with the proposed program, even combined with the related projects, would cause a cumulatively considerable impact related to odors. The highly dispersive nature of diesel exhaust and the short-term nature of many operational and maintenance-related activities (e.g., periodic management of levee vegetation, regular inspection and maintenance of pump equipment) would likely not cumulatively contribute to odor impacts. Therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to emissions of TACs or odors.

Biological Resources—Aquatic

Nearly all of the potential effects of the proposed program on aquatic biological resources would occur in the Extended SPA; therefore, the Extended SPA is considered the geographic context for the cumulative impact analysis. Section 3.5, “Biological Resources—Aquatic,” provides a detailed discussion of aquatic biological resources within the study area.

Past and present activities by humans have substantially changed aquatic habitats in the Extended SPA compared to historical conditions. These changes have resulted in cumulative adverse impacts on the distribution, abundance, and species composition of native fish assemblages within the Sacramento and San Joaquin Rivers and their tributaries. Numerous factors have contributed to these impacts: substantial alteration of flow regimes

and reduction of flows; dewatering of stream reaches; isolation of floodplains from the river channel by channelization and levee construction; substantial reductions in the frequency, magnitude, and duration of floodplain inundation; habitat fragmentation by physical barriers; creation of false migration pathways by flow diversions; introduction of nonnative fish species; and poor water quality. Several species are in decline as a result of these ongoing activities in the study area: delta smelt, longfin smelt, green sturgeon, Sacramento splittail, hardhead, Pacific lamprey, river lamprey, Central Valley fall-run and spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and Central Valley steelhead. (See Table 3.5-2 in Section 3.5 of this PEIR for the locations of habitat for these fish species.) Striped bass, an important game species, is also in decline. Fisheries management plans and restoration programs, including the San Joaquin River Restoration Program and the CALFED Bay-Delta Program's Ecosystem Restoration Program Plan, have been initiated to offset the negative effects of ongoing activities; however, many reasonably foreseeable future projects would be expected to contribute to continued adverse effects on aquatic resources, such as increased housing density near waterways.

As discussed in Section 3.5 of this PEIR, implementing NTMAs and LTMAs could affect special-status fish, fish movement, nursery ground usage, riparian habitat, designated critical habitat, and essential fish habitat in several ways. Specifically, water quality could be degraded; overhead cover and instream woody material (IWM) could be lost; hydrostatic pressure, underwater noise, and vibrations could increase; and there could be increased availability of floodplain habitat (a potentially beneficial effect unless the floodplain habitat creates opportunities for fish stranding after floodwaters recede).

Impacts would be reduced to less-than-significant levels with implementation of Mitigation Measure BIO-A-4 (NTMA and LTMA) for increases in hydrostatic pressure, underwater noise, and vibrations and Mitigation Measure BIO-A-6 (NTMA and LTMA) for potential fish entrapment associated with increased availability of floodplain habitat. Given the minor level of impact after mitigation and the overall beneficial effect of increasing floodplain habitat, the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to these activities.

Short-term construction activities associated with NTMAs and LTMAs would involve grading and moving earth, which could result in soil erosion, stormwater discharges of suspended solids, and increased turbidity. Grading and earthmoving could also mobilize other pollutants from project-related construction sites, which could adversely affect fish habitat

(riparian habitat, critical habitat, and essential fish habitat), movement, and populations, including special-status species. In addition, contaminants such as concrete, fuels, oils, and other petroleum products used in construction activities could be introduced in the water system, either directly or through surface runoff. Contaminants may be toxic to fish and benthic macroinvertebrates or may change oxygen diffusion rates, thus causing acute and chronic toxicity to aquatic organisms and reducing their growth and survival. However, each project proponent must prepare a storm water pollution prevention plan (SWPPP) consistent with the existing statewide National Pollutant Discharge Elimination System (NPDES) discharge permits from the appropriate regional water quality control board (RWQCB). Implementing a SWPPP would cause the project to avoid increasing sedimentation and turbidity or releasing contaminants that could degrade aquatic habitats and adversely affect aquatic species. The proponent for each related project that would discharge stormwater runoff would also be required to prepare a SWPPP and comply with NPDES discharge permits from the appropriate RWQCB. Therefore, the proposed program's construction activities would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to effects of pollutants on fish habitat, movement, and populations.

Construction, remediation, or altering levees and/or the adjoining riverbanks for NTMAs and LTMAs could require removing overhead cover and IWM (which is an important component of shaded riverine aquatic (SRA) habitat) from the river channel. Removing overhead cover and IWM could result in the loss of refugia for special-status fish from predators and high flows. It could also reduce the number of pool-forming structures and the storage capacity of the river channel for sediment and organic matter as flows are passed more quickly downstream. The project proponent would obtain a Section 1602 streambed alteration agreement from the California Department of Fish and Game (DFG), and would consult or coordinate with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service under the federal Endangered Species Act, and DFG under the California Endangered Species Act, regarding potential impacts on listed fish species (Mitigation Measure BIO-A-2a (NTMA and LTMA)). SRA habitat would be inventoried and revegetation would occur on site; if on-site compensation would not be feasible, off-site mitigation could occur, or mitigation bank credits could be acquired (Mitigation Measure BIO-A-2b (NTMA and LTMA)). In addition, DWR will coordinate with the levee maintenance agencies tasked with implementing the VMS to develop and implement a plan to record data on riparian vegetation lost or removed as a result of implementation of the VMS, and to ensure adequate compensation for losses of riparian habitat functions and values (Mitigation Measure BIO-A-2b (NTMA and LTMA)). However, there could still be a localized net loss of SRA habitat,

and it cannot be assured that under all circumstances, a potentially significant and unavoidable project-specific impact would not occur related to issues such as habitat connectivity.

Looking solely at the overall acreage of SRA habitat, implementing required mitigation measures under the proposed program would result in no net loss of acreage of SRA habitat (i.e., whatever SRA habitat could not be compensated for on a specific project site would be created elsewhere). It is possible that although some stream or river reaches may benefit from compensatory habitat, habitat values in other stream or river reaches could be substantially reduced, adversely affecting special-status fish species that must move through these river reaches. Potential adverse effects include increased predation risk, increased water temperatures, and reduced food availability. However, on a broader cumulative basis, implementing required mitigation measures would result in no net loss of habitat extent, function, and value within the overall study area because whatever aquatic habitat could not be compensated for on a specific project site would be created elsewhere. Therefore, from a cumulative context, the proposed program would not result in a cumulatively considerable incremental contribution to the cumulative loss of SRA habitat.

Replacing natural bank substrates with riprap can adversely affect important ecosystem functions. Living space and food for terrestrial and aquatic invertebrates are lost, eliminating an important food source for special-status fish species. Part of the proposed program could involve removing riprap and creating setback levees and floodplain habitat, which would help offset the effects of placing any new levee riprap. Implementing Mitigation Measure BIO-A-5 would require replacement of lost vegetation and IWM, but replacing all vegetation and IWM may not be possible in the immediate vicinity of a project site because some areas—especially urban areas—may lack the right-of-way needed to implement vegetation replacement. However, on a broader cumulative basis, implementing required mitigation measures would result in no net loss of habitat extent, function, and value within the overall study area because whatever aquatic habitat could not be compensated for on a specific project site would be created elsewhere. Therefore, from a cumulative context, the proposed program would not result in a cumulatively considerable incremental contribution to the cumulative loss of aquatic habitat.

Ongoing activities and several reasonably foreseeable future projects and programs will affect aquatic biological resources. Many of these projects and programs may adversely affect special-status fish, but others are likely to improve their condition. The net effect of new and ongoing programs, projects, and restoration efforts is difficult to predict; however, over time, the net effect expected would be a reduction or cessation of the fish

declines. Despite potential future projects that could benefit special-status fish, it is clear that the effects of past, present, and reasonably foreseeable future projects on special-status fish species have resulted in a significant cumulative impact on these species. Implementing mitigation measures related to loss of overhead cover and IWM and placement of natural bank substrates would reduce impacts on aquatic biological resources associated with the proposed program. These impacts would not necessarily be reduced to a less-than-significant level in all cases for project-specific impacts (because creating compensatory habitat may not be possible in the vicinity of project-specific impacts), or for all elements of the aquatic ecosystem important to special-status fish species. However, on a broader cumulative basis, implementing required mitigation measures would result in no net loss of habitat extent, function, and value within the overall study area because whatever aquatic habitat could not be compensated for on a specific project site would be created elsewhere. Therefore, from a cumulative context, the proposed program would not result in a cumulatively considerable incremental contribution to the cumulative loss of special-status fish, fish movement, designated critical habitat, and essential fish habitat.

Biological Resources—Terrestrial

Cumulative impacts on terrestrial biological resources would occur primarily in the Extended SPA, where most program activities would be implemented, and to a lesser extent in the Sacramento and San Joaquin Valley watersheds. Section 3.6, "Biological Resources—Terrestrial," provides a detailed discussion of terrestrial biological resources within the study area.

Past actions by humans have substantially changed wildlife populations and vegetation compared with historical conditions. Large areas of native riparian and wetland vegetation in the Extended SPA have been lost or degraded in the past 150 years. USFWS estimates that more than 90 percent of wetland and riparian habitat has been lost in the Central Valley compared with historic levels. Moreover, USFWS identifies most of these losses as having resulted from construction of facilities for federal and State water projects and modification of flow patterns below dams, particularly channelization, and clearing or filling for the conversion to agricultural and urban land uses. Many of these activities have also introduced nonnative plant and animal species, which in many cases have competed with and degraded habitat for native species. These changes have resulted in overall significant adverse effects on the extent, species composition, and functioning of wetlands, riparian habitats, and other sensitive communities, as well as on the distribution and abundance of wildlife species. The threatened and endangered status of numerous plant and animal species, and the dramatic reductions in the extent of wetland

and riparian vegetation in the study area, are evidence of these overall significant cumulative adverse effects. Present and future projects being implemented across the Central Valley, such as residential and urban development and flood-control improvement projects, would continue to result in adverse effects on terrestrial biological resources. Some of these projects, however, would implement compensatory mitigation, creating habitat and preserves to increase these habitats and their values for ecosystem functions and special-status species. Examples of such mitigation include setting back levees on the Feather River and creating habitat in the Natomas Basin, which would increase riparian floodplain and wetland habitat important to special-status fish and wildlife species (e.g., Swainson's hawk and giant garter snake). The San Joaquin River Restoration Program would result in future structural and channel improvements to benefit special-status fish and wildlife species. In addition, reasonably foreseeable future actions include several restoration programs and plans from which vegetation and wildlife resources would benefit.

Many future projects that would result in significant impacts on terrestrial biological resources will be required to identify and provide mitigation in compliance with the federal and California endangered species acts, CEQA, and other State, local, and federal statutes; however, many types of habitats and species are provided no protection. Therefore, continued net loss of some types of native habitat is expected for plants and wildlife not directly tied to the needs of a threatened or endangered species.

However, even with compliance with regulatory requirements and implementation of mitigation, a continued decline in the extent and quality of terrestrial biological resources is expected in the program area. The overall loss of sensitive habitats, the numerous threatened and endangered species subject to those losses, the ongoing declines of other species, and continuing conversions of habitats and open space lands to various forms of development demonstrate that past, present, and reasonably foreseeable future projects combine to result in significant cumulative impacts on terrestrial biological resources.

As discussed in Section 3.6 of this PEIR, implementing construction-related NTMAs and LTMAs could result in the disturbance and loss of sensitive natural communities, particularly aquatic and riparian habitats, and in the direct removal and filling of wetlands and waterways. (See Figures 3.6-1a and 3.6-1b in Section 3.6 of this PEIR for the locations of these habitats.) Removal and loss of these sensitive natural communities could contribute to additional impacts: fragmentation or substantial alteration of these habitats, increased distribution of invasive plants and wildlife, take of special-status plants and wildlife, loss of primary

movement corridors for many special-status wildlife species, and modification of designated critical habitat.

In addition, implementing construction-related NTMAs and LTMAs could conflict with local plans and policies, including habitat conservation plans, by reducing the viability of special-status species, reducing habitat value or interfering with the management of conserved lands, or eliminating opportunities for conservation actions.

Mitigation measures are proposed in Section 3.6 of this PEIR to avoid, minimize, and where appropriate, compensate for potential impacts on sensitive natural communities, critical habitat, special-status plants and wildlife, wildlife movement corridors, and local plans. Construction-related impacts would be reduced to less-than-significant levels with implementation of Mitigation Measures BIO-T-1a and BIO-T1b (NTMA and LTMA) for sensitive natural communities and critical habitat; BIO-T-3a, BIO-T-3b, and BIO-T-3c (NTMA and LTMA) for special-status plants and wildlife; BIO-T-4 (NTMA and LTMA) for wildlife movement; and BIO-T-5a and BIO-T-5b (NTMA and LTMA) for local plans and policies. Because of the availability of off-site compensation for impacts on habitats and species, implementing these mitigation measures would result in no net loss to these resources, and the proposed program would not make a cumulatively considerable incremental contribution to cumulative impacts related to this issue.

As described above under "Biological Resources—Aquatic," short-term construction activities associated with NTMAs and LTMAs would involve grading and moving earth, which could result in soil erosion, stormwater discharges of suspended solids, releases of pollutants, and increased turbidity in nearby aquatic habitats. These conditions could have adverse effects on special-status wildlife species that occur in affected aquatic habitats. However, as described above, each project proponent must prepare a SWPPP consistent with the existing statewide NPDES discharge permits from the appropriate RWQCB. Implementing a SWPPP would cause the project to avoid increasing sedimentation and turbidity or releasing contaminants that could degrade aquatic habitats and adversely affect special-status species using these habitats. The proponent for each related project that would discharge stormwater runoff would also be required to prepare a SWPPP and comply with NPDES discharge permits from the appropriate RWQCB. Therefore, the proposed program's construction activities would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the effects of pollutants on sensitive habitats and special-status plant and wildlife species.

As mentioned above, the VMS includes guidelines for levee remediation design, a long-term vegetation life-cycle management plan, and coordination with DFG and USFWS. Implementing the VMS in conjunction with the CVFPP Conservation Strategy Framework could result in substantial adverse effects on sensitive habitats, special-status species, and wildlife movement corridors through removal of riparian vegetation. Implementation of Mitigation Measures BIO-T-7a and BIO-T-7b would ensure that through on-site and off-site (if needed) creation, restoration, and enhancement of riparian vegetation, the overall extent of riparian vegetation would not be reduced. On a broader cumulative basis, implementing required mitigation measures would result in no net loss of habitat extent, function, and value within the overall study area because whatever terrestrial habitat could not be compensated for on a specific project site would be created elsewhere. Therefore, from a cumulative context, the proposed program would not result in a cumulatively considerable incremental contribution to the cumulative loss of terrestrial habitat.

Operating new large-scale facilities and changing the operation of existing facilities under the proposed program might ultimately affect the timing and volume of downstream flows. However, any changes would remain within the range of normal flow variability under existing conditions and would not be sufficient to result in substantial alterations to existing habitats or significant adverse effects to special-status plant or wildlife species. The relative minor changes to flows associated with the proposed program would not result in a cumulatively considerable incremental contribution to the cumulative loss of habitats and special-status species.

As discussed above, the ability to provide compensatory off-site mitigation allows, in almost all cases, for implementation of NTMAs and LTMAs to result in no net loss in functions and values of terrestrial biological resources in the overall program study area. On a broader cumulative basis, implementing required mitigation measures would result in no net loss of habitat extent, function, and value within the overall study area because whatever terrestrial habitat could not be compensated for on a specific project site would be created elsewhere. Therefore, from a cumulative context, the proposed program would not result in a cumulatively considerable incremental contribution to the cumulative loss of terrestrial habitat.

Climate Change and Greenhouse Gases

Emissions of greenhouse gases (GHGs) are inherently a cumulative impact, because the emissions of any single project would not cause global climate change. Instead, it is the GHG emissions from multiple projects throughout the world that may result in a cumulative impact with respect to global

climate change. The issue is whether a single project makes a cumulatively considerable incremental contribution to this cumulatively significant cumulative impact. Please see Section 3.7, "Climate Change and Greenhouse Gas Emissions," for a discussion of this inherently cumulative topic area. As identified in Section 3.7, construction and operation of NTMAs and smaller scale LTMAs (i.e., LTMAs of similar size, intensity, and scale as NTMAs) would not result in a cumulatively considerable incremental net contribution to GHG emissions. However, assessing net GHG emissions from larger scale projects (e.g., widening floodways, constructing new levees) is difficult because of the potential of such projects to simultaneously increase and reduce GHG emissions. For example, an enlarged or new bypass could place existing agricultural lands within a floodway. Reduced agricultural activity on these lands during the flood season could result in a net reduction in annual GHG emissions relative to existing conditions. However, the need to restore agricultural lands to production after inundation events could require additional energy and fuel not needed for flood-protected agricultural lands, resulting in additional GHG emissions. Therefore, the overall incremental contribution of large-scale LTMAs to cumulative GHG emissions cannot be ascertained. Because of the uncertainty surrounding these impacts, no determination regarding their significance is provided. Consistent with Section 15145 of the CEQA Guidelines, these impacts are too speculative for evaluation.

Cultural and Historic Resources

The cumulative context for cultural and historic resources is defined as the Extended SPA and the Sacramento and San Joaquin Valley watersheds, which primarily incorporate three archaeological regions: the Central Valley, Northeastern, and Sierra Nevada. The eastern edge of the North Coast region is also included.

As discussed in Section 3.8, "Cultural and Historic Resources," cultural resources may consist of prehistoric sites, historic sites, historic structures, ethnographic resources, and isolated artifacts. During the 19th and 20th centuries, localized urbanization and intensive agricultural use resulted in the destruction or disturbance of numerous prehistoric sites, and many structures now considered to be historic were erected. From the latter half of the 20th century to the present, prehistoric and historic structures have been disturbed and destroyed. Various regulations protecting cultural resources were developed and enforced during this period, substantially reducing the rate and intensity of these impacts. However, even with these regulations, cultural resources are still degraded or destroyed as cumulative development proceeds, resulting in significant adverse cumulative impacts on cultural resources.

Prehistoric human habitation sites are relatively common in riverbank, natural overbank deposits, and floodplain areas, and burial sites (including marked and unmarked cemeteries) are occasionally encountered in the course of ground-disturbing activities. As discussed in Section 3.8 of this PEIR, it is likely that known or unknown archaeological resources could be disturbed and cultural resources damaged or destroyed during construction of NTMAs and LTMAs. Losses of an archaeological resource could occur where excavations encounter archaeological deposits that cannot be removed or recovered (e.g., underneath new facilities), or where recovery would not be sufficient to prevent the loss of the cultural material's significance. Historic resources could also be damaged or require removal from areas where new facilities or floodway expansions would occur. If these resources would be eligible for listing in the National Register of Historic Places, the impact of their modification or destruction would be significant. In addition, traditional cultural properties (which can be archaeological or built-environment resources, or features of the natural landscape) could be damaged or destroyed, or loss of use could occur if access to such properties is removed.

Implementing Mitigation Measures CUL-1 (NTMA and LTMA) through CUL-5 (NTMA and LTMA) would reduce effects on potentially significant cultural resources; however, adverse effects on significant historic buildings and structures and traditional cultural properties may still occur. Therefore, Impacts CUL-3 (NTMA and LTMA), and CUL-4 (NTMA and LTMA) would be potentially significant and unavoidable.

Reasonably foreseeable future projects related to the CVFPP could result in the same potentially significant impacts on the same types of cultural resources described above. Even if related projects were to implement mitigation measures, adverse impacts would likely still occur, and thus the impacts of the related projects would be significant and unavoidable. Loss of archaeological resources would add to a historical trend in the loss of these resources as artifacts of cultural significance and as objects of research significance. Therefore, as urban development proceeds, a significant and unavoidable cumulative impact is ongoing in the project region. Despite implementation of Mitigation Measures CUL-1 (NTMA and LTMA) through CUL-5 (NTMA and LTMA), the proposed program would result in a cumulatively considerable, incremental contribution to a cumulatively significant and unavoidable impact related to cultural and historic resources.

Energy

A substantial amount of energy is used in the Extended SPA and the Sacramento and San Joaquin Valley watersheds, not only for water conveyance–related purposes but also for municipal, agricultural,

industrial, and transportation-related purposes. Hydroelectric facilities and associated pumped-storage use of electric resources in the Extended SPA and the Sacramento and San Joaquin Valley watersheds—including federally owned CVP facilities, State-owned SWP facilities, and local and privately owned facilities—were considered as the cumulative context for energy resources. The Extended SPA and the Sacramento and San Joaquin Valley watersheds have been extensively developed for large and small hydroelectric facilities with construction of dams and reservoirs. These facilities are described in Section 3.9, "Energy."

Although a substantial amount of energy is used annually in California (and specifically in the program study area), this is primarily because of the state's size and not the efficiency or inefficiency of energy use. Multiple laws, regulations, and programs within the state require or promote the efficient use of energy. Among these are various pieces of climate change legislation and the policies and programs implemented to comply with that legislation. See Table 3.7-1 in Section 3.7, "Climate Change and Greenhouse Gas Emissions," for a summary of State laws and executive orders that address climate change, many of which have the effect of promoting or requiring the efficient use of energy in the state and the expansion of renewable-energy generation and use. California's building codes (California Code of Regulations, Title 24) also contain stringent energy efficiency standards, and the State has adopted a specific California Green Building Standards Code that both includes energy efficiency requirements and addresses renewable energy generation (e.g., rooftop photovoltaic solar panels). Given these conditions, a cumulative adverse effect is not expected to occur in the program study area related to the substantially inefficient, wasteful, or unnecessary long-term consumption of energy or a substantial reduction in the generation of renewable energy.

Constructing, operating, and maintaining the facilities proposed under NTMAs and LTMAs would require the direct and indirect use of energy resources. Direct energy use would involve using petroleum products and electricity to operate construction equipment, such as trucks and power tools. Indirect energy use would involve consuming energy to extract raw materials, manufacture items, and transport the goods necessary for construction, operations, and maintenance activities. These activities would cause irreversible and irretrievable commitments of nonrenewable energy resources, such as gasoline and diesel fuel. However, the extent to which these activities would increase energy consumption would be limited because the work would be temporary. No long-term energy use would be required and it is not anticipated that energy use would be inefficient, wasteful, or unnecessary. Therefore, these effects would not cause a cumulatively considerable incremental contribution to a significant cumulative impact related to energy use.

Modifications to reservoir operations included in the proposed program would not result in a long-term reduction in hydroelectric power generation (see Section 2.6, "No Near- or Long-Term Reduction in Water or Renewable Electricity Deliveries"). Therefore, the proposed program would not result in a substantial reduction in the generation of renewable energy and would not cause a cumulative considerable incremental contribution to a significant cumulative impact related to this issue.

Geology, Soils, and Seismicity (Including Minerals and Paleontological Resources)

The cumulative context for geology, soils, seismicity, minerals, and paleontological resources is defined as the Extended SPA and the Sacramento and San Joaquin Valley watersheds. However, geologic formations and soil types vary depending on location, and thus are site specific.

Geology, Soils, and Seismicity As discussed in Section 3.10, "Geology, Soils, and Seismicity (Including Minerals and Paleontological Resources)," strong seismic ground shaking and associated hazards such as liquefaction, surface fault rupture, and landslides would be of primary concern in the Coast Ranges, which are seismically active. Landslides are also of concern in any area of steep slopes, regardless of the seismic activity. Soil erosion, subsidence, shrink-swell potential, and soil corrosivity also may pose a hazard to engineered structures and facilities. However, implementing NTMAs and LTMAs, such as levee repairs or improvements, would increase the resistance of the levees to damage and failure from a seismic event and from other geologic and soils related hazards (e.g., landslides, soil erosion). Improving the levee and flood conveyance systems would stabilize existing levees, and any new structures built (such as setback levees) would meet currently accepted engineering standards. As a result, facilities would be stronger and more resilient than when they were originally constructed. This would result in a beneficial impact.

The related projects would be subject to the same seismic, geologic, and soils hazards as the proposed program. However, all construction in California is subject to engineering requirements contained in the California Building Standards Code, which incorporates earthquake- and liquefaction-resistant design standards, in addition to design standards related to geologic and soil engineering properties. Accordingly, no additive effect would result and no cumulatively considerable impact related to seismic or soil hazards would occur. Therefore, implementation of the proposed program, when considered with the related projects, would not create additional facilities under increased risk of seismic and geologic hazards, nor would it result in a cumulatively considerable incremental

contribution to a significant cumulative impact related to geology, soils, or seismicity.

It is possible that some LTMAs could include new wastewater-generating facilities (e.g., a restroom at a pump station) in remote locations that could not connect to a municipal sewer system. Such facilities would rely on septic tanks or alternative wastewater disposal systems for this purpose. It is possible that an area with unfavorable soils could be considered for a septic tank or alternative wastewater disposal system. However, if this were to occur, various engineering methods could be used to overcome limitations from unfavorable soils and applicable federal, State, and local regulations to ensure implementation of these measures when needed. These same regulations' corrective measures would be applied to related projects that would require installation of septic tanks or alternative wastewater disposal systems. Therefore, the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to placement of septic tanks or alternative wastewater disposal systems in areas with unfavorable soils.

Minerals The presence of mineral resources depends on the type of geologic formation, which varies from location to location, and thus is site specific. Aggregate resources, which are typically located in or near channels or floodplains in the Extended SPA, are the mineral resources most likely to be affected by program-related activities. However, mining activity is generally precluded within or in the immediate vicinity of the footprint of existing structures, such as levees, to preserve the stability of those structures.

As discussed in Section 3.10 of this PEIR, many NTMAs would occur within the footprint of existing structures, and thus would not eliminate access to mineral resources. Other NTMAs, such as constructing setback levees, would be implemented in the immediate vicinity of existing structures, and would also not eliminate access to mineral resources. However, LTMAs that would entail constructing new facilities, such as new flood bypasses, could occur in areas that contain valuable deposits of mineral resources. If those mineral resources, particularly aggregates, were mined as part of project-related construction activities (i.e., used in the project's construction process), no significant impact would occur. However, if mining were to not occur, the loss of access to valuable mineral resources would be a potentially significant and unavoidable impact.

Depending on their location, some of the related projects could also be located in areas of valuable mineral deposits. If those deposits were mined as part of the construction activities of the related projects, a significant

impact would not occur. However, it is not possible to determine whether the related projects would incorporate the use of any known aggregate resource deposits in their construction plans. Consequently, because of the widespread locations where LTMA construction activities under the proposed program and the related projects could occur, it is possible that two or more projects could combine to prevent access to valuable mineral resources in the same area. Thus, implementing LTMAs would result in a cumulatively considerable incremental contribution to a significant cumulative impact from loss of mineral resources.

Paleontological Resources Fossils are being discovered with increasing frequency throughout California during excavation and earthmoving activities associated with development. The value or importance of different fossil groups depends on several factors: the age and depositional environment of the rock unit that contains the fossils, their rarity, the extent to which they have already been identified and documented, and the ability to recover similar materials under more controlled conditions (such as for a research project). Discoveries of unique, scientifically important fossils are relatively rare. The likelihood of encountering them varies from site to site and is based on the specific type of geologic rock formation found underground. These geologic formations also vary, depending on location.

As discussed in Section 3.10 of this PEIR, construction activities associated with NTMAs and LTMAs have the potential to damage or destroy unique paleontological resources, if those activities would be located in paleontologically sensitive rock formations. However, implementing Mitigation Measure GEO-6 (NTMA and LTMA) would reduce this impact to a less-than-significant level.

The related projects also have the potential to damage or destroy unique paleontological resources during construction activities, if those activities would occur in paleontologically sensitive rock formations. It is not known whether all of the related projects would implement appropriate mitigation measures that would reduce or avoid impacts on paleontological resources. Therefore, the related projects themselves could result in significant impacts.

As discussed in Section 3.10, Mitigation Measure GEO-6 (NTMA and LTMA) specifies that, when necessary, construction personnel are to be appropriately educated before beginning construction in areas of moderate to high paleontological sensitivity. Any unique, scientifically important fossils encountered during construction must be recovered and appropriately curated by a paleontologist. When such worker education, fossil recovery, and curation occur, the subsequent opportunities for data collection and study generally benefit the scientific community. The

presence of unique paleontological resources is site specific; a low probability exists that any project would encounter unique, scientifically important fossils; and benefits would result from recovery and further study of any fossils that might be encountered. Therefore, with implementation of Mitigation Measure GEO-6 (NTMA and LTMA), the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to paleontological resources.

Groundwater Resources

The cumulative context for groundwater resources is defined as the Extended SPA, the Sacramento and San Joaquin Valley watersheds, and the SoCal/coastal CVP/SWP service areas. The Sacramento River, San Joaquin Valley, and San Francisco Bay hydrologic regions are the primary hydrologic regions in the study area. These hydrologic regions are described in Section 3.11, "Groundwater Resources."

Based on past, present, and reasonably foreseeable projects, groundwater levels in the study area are generally substantially reduced from historical levels, resulting in an overall significant cumulative impact on groundwater basins (see Figures 3.11-2 and 3.11-3 in Section 3.11 of this PEIR). Groundwater in the study area has historically been used to supplement surface water supplies. Changing environmental laws and requirements and the effects of droughts have resulted in greater reliance on groundwater supplies and conjunctive management practices. These actions have created overdraft in some portions of the study area.

NTMAs and LTMAs could involve modifying, constructing, or removing facilities, which could result in temporary and short-term construction-related disturbance of hydrology and soil, as well as associated human-caused effects on the quality of the water encountered during construction activities. These types of disturbances could degrade the quality of waters recharging the groundwater aquifer of affected and adjacent areas. If hazardous materials were to be discharged to the land surface or surface waters during these activities, they could travel to underlying aquifers; if the volume of discharge were sufficient, such hazardous materials could degrade the quality of local groundwater sufficiently to impair its continued use. However, each project proponent must prepare a SWPPP consistent with the existing statewide NPDES discharge permits from the appropriate RWQCB. SWPPPs would be prepared for NTMAs and LTMAs, identifying best management practices to prevent or minimize the introduction of contaminants into surface waters. The proponent for each related project that would discharge stormwater runoff would also be required to prepare a SWPPP and comply with NPDES discharge permits from the appropriate RWQCB. Therefore, the construction, operations, and maintenance activities associated with the proposed program would not

result in a cumulatively considerable incremental contribution to a significant cumulative impact related to localized degradation of groundwater quality from construction, operation, and maintenance activities.

Changing the operation of the water supply system, including the magnitude and timing of flood releases and reservoir allocations, might result in changes in the timing, duration, and frequency of river flows. Changes in river flow and subsequent surface water deliveries could require that groundwater pumping be increased to meet water supply needs. Groundwater quality could be affected by increased pumping if the pumping were to induce intrusion of saline water or upwelling of poor-quality water into aquifers used for water supply. Changes in downstream flow could reduce natural recharge, and changes in deliveries of surface water could require that groundwater pumping increase to meet water supply needs. However, implementing NTMAs or LTMAs would not affect the capacity of reservoirs, the volume of water in the reservoirs, or carryover storage (see Impact HYD-6 (NTMA), "Reduced Long-Term Water Supplies from Reservoir Operational Criteria Changes," in Section 3.13, "Hydrology") in a way that would increase the demand on groundwater supplies such that groundwater quality would be degraded or depleted. In addition, implementing the proposed program would not reduce long-term water deliveries to the SoCal/coastal CVP/SWP service area (see Section 2.6, "No Near- or Long-Term Reduction in Water or Renewable Electricity Deliveries"). Therefore, changes in reservoir operations included in NTMAs and LTMAs would have negligible effects on surface water supply and groundwater supply and quality and would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to degradation of groundwater quality and depletion of groundwater.

Activities that could be implemented under the proposed program include improvement, remediation, repair, and reconstruction of existing levees. Depending on site conditions, slurry walls may be included in the improvement, remediation, repair, or reconstruction. Under certain conditions, there is the potential that installation of slurry cutoff walls could modify groundwater flow patterns, and affect connectivity between streams and groundwater on a regional or localized basis. In cases when water flows out of the river and into groundwater aquifers, a slurry wall could reduce natural recharge into the groundwater on the landside of the levee. In the opposite scenario, when the aquifer discharges to the river, groundwater levels on the land side of slurry cutoff walls could increase and potentially remain elevated for an extended time period. The degree to which these impacts could be realized depends on many factors, including the local geology and depth of the slurry wall in relation to saturated

aquifer units, the length of the slurry wall, the interconnectedness of aquifer units, the local interactions between surface and groundwater flows, soil types, and surface water conditions.

In the case where a slurry wall could reduce recharge to nearby shallow aquifers, any impact in the form of decreased water-table elevation would likely only impact the shallow aquifer as deep as the bottom of the wall. Furthermore, it is not anticipated that these potential impacts would propagate beyond the vicinity of the slurry wall and would thus be localized and would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted). Therefore, slurry walls included in improvement, remediation, repair, or reconstruction of levees in NTMAs or LTMAs would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to depletion of groundwater quality or interfere substantially with groundwater recharge.

LTMAs could involve enhancing groundwater recharge and banking to supplement surface water supplies in conjunction with reservoir operations. Although groundwater banking is generally beneficial, potentially significant adverse impacts could occur if groundwater banking were not properly planned before implementation or if sufficient monitoring were not conducted during operation. Specific impacts include degradation of water quality resulting from entrainment of chemicals currently in the unsaturated zone and encroachment of groundwater levels on the land surface. Implementing Mitigation Measures GRW-5a (LTMA) and GRW-5b (LTMA) would reduce this potentially significant impact to a less-than-significant level because the project proponent would develop groundwater management plans or expand existing groundwater management plans.

Basin management objectives, groundwater monitoring plans, and conditions under which corrective actions must be taken would be defined. The project proponent would also conduct Phase I Environmental Site Assessments. One or more of the related projects could include groundwater recharge, but it is not possible to ascertain at this time what types of mitigation measures, if any, might be undertaken as part of those projects. However, the implementation of groundwater recharge projects is regulated by the appropriate RWQCB and the California Department of Public Health with the express purpose of preventing degradation of groundwater quality. Groundwater recharge projects must comply with numeric and narrative water quality standards as set forth in the relevant basin plan, which also incorporates the State’s Anti-Degradation Policy

(i.e., State Water Resources Control Board Resolution 68-16). Therefore, it is unlikely that any of the related projects would result in significant adverse effects on groundwater quality from recharge. For the reasons stated above, implementing LTMAs would not result in a cumulatively considerable contribution to a significant cumulative impact related to potential groundwater recharge and banking projects.

Hazards and Hazardous Materials

The cumulative context for hazards and hazardous materials impacts is defined as the Extended SPA and the Sacramento and San Joaquin Valley watersheds. However, health and safety impacts associated with past or current uses of a project site usually occur on a project-by-project basis, rather than in a cumulative manner.

As discussed in Section 3.12, "Hazards and Hazardous Materials," construction of NTMAs and LTMAs (like construction of the related projects) would involve the storage, use, disposal, and transport of hazardous materials (e.g., asphalt, fuel, lubricants, solvents) to varying degrees during demolition, construction, and operations. Facilities that would use hazardous materials after construction would be required to obtain permits and comply with appropriate standards of regulatory agencies to avoid releases of hazardous waste. Storage, use, disposal, and transport of hazardous materials are extensively regulated by various federal, State, and local agencies. Construction companies, businesses, and organizations (during the operational phase) that would handle any hazardous substances would be required by law to implement and comply with these existing regulations. Therefore, a cumulatively significant impact would not occur, and the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact associated with hazardous materials storage and transport.

Impacts associated with hazardous emissions and the handling of hazardous materials near schools during construction of NTMAs and LTMAs would be potentially significant, based on the measurable distance of 0.25 mile. Both the proposed program and the related projects could potentially use hazardous materials within this distance. Implementing Mitigation Measure HHM-2 (NTMA and LTMA) would reduce the CVFPP's impact to a less-than-significant level by eliminating or substantially reducing the potential exposure of students to hazardous materials. This impact would occur only in site-specific locations (i.e., within 0.25 mile of any school); thus, the impact is only cumulative in nature when a related project involving hazardous emissions or handling of hazardous materials occurs within 0.25 mile of the same school and at the same time as another project. The impact of the proposed program would be reduced to a less-than-significant level

(i.e., potential exposure of students to hazardous materials would be eliminated or substantially reduced), and the proposed program is highly unlikely to interact in a cumulative manner with a related project under this impact mechanism. Therefore, the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to exposure to hazards or hazardous materials near a school.

Implementing the CVFPP could result in exposure of workers and the public to on-site hazardous materials during construction of NTMAs and LTMAs. For example, potential sources of hazardous materials such as underground storage tanks, underground pipes containing asbestos, contaminated soils, and septic systems could be encountered during excavations. Under the proposed program implementing Mitigation Measures HHM-3a, HHM-3b, and HHM-3c (NTMA and LTMA) would minimize the potential for exposure of people and the environment to hazardous materials encountered during construction activity and include the cleanup (as required by law) of any contamination encountered, which would prevent future exposure. In addition, if hazardous materials were to be encountered on site during construction of the proposed program or related projects, the associated impacts would be localized to those project sites and would not be additive—that is, would not interact on a cumulative basis. Therefore, implementing the program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to exposure to existing hazardous materials.

There is the potential for some NTMAs and LTMAs to result in the creation of habitat conditions attractive to birds in the vicinity of active airports. If increased numbers of certain types of birds (e.g., waterfowl, shorebirds) were to occur near airports, this could increase bird-strike hazards for aircraft. Mitigation Measure HHM-4 (NTMA and LTMA) would reduce this impact to a less-than-significant level by requiring the project proponent to conduct a preproject avian risk analysis near airports, coordinate with the airport if a substantial increase in risk would occur, and prepare and implement a wildlife hazard management plan in coordination with the airport if necessary. Therefore, any increase in bird-strike hazards that might be generated by an NTMA or LTMA would be minimal. It is typical for airports to actively monitor planned projects in their vicinity and address potential increases in bird-strike hazards. Therefore, related projects that could occur near the same airports as NTMAs and LTMAs would also be required to address and mitigate for potential increases in bird-strike hazards. Therefore, it is not expected that a significant cumulative impact related to increased risk of bird-strike hazards would occur, and the proposed program would not result in a cumulatively

considerable contribution to a significant cumulative impact related to this issue.

Construction of some NTMAs and LTMAs could occur in areas designated as High or Very High Fire Hazard Severity Zones by the California Department of Forestry and Fire Protection's Fire and Resource Assessment Program. Operating construction equipment in these areas has a higher probability of sparking an uncontrolled wildland fire than operating such equipment in areas with lower fire hazard severity designation. However, the fire protection and prevention standards of the Occupational Safety & Health Administration (OSHA) of the U.S. Department of Labor (Code of Federal Regulations Title 29, Section 1926.150, Subpart F) require employers to implement various measures to minimize and address wildland fire risk. The project proponents for NTMAs and LTMAs and the proponents for related projects in High and Very High fire hazard severity zones would be required to comply with the various elements of OSHA's fire protection and prevention standard during all phases of construction; therefore, the potential for construction activities to spark an uncontrollable wildland fire is considered remote. It is not expected that a significant cumulative impact related to ignition of uncontrolled wildland fires during construction would occur, and the proposed program would not result in a cumulatively considerable contribution to a significant cumulative impact related to this issue.

The creation of mosquito-breeding habitat and the associated increase in mosquitoes and mosquito-borne diseases affects each regional area covered by applicable mosquito and vector control districts. When necessary, each district employs biological vector controls to reduce populations of mosquitoes throughout its service area. Implementing NTMAs and LTMAs could increase mosquito habitat because increasing floodplain size could cause areas of standing water to increase. Implementing Mitigation Measure HHM-6 (NTMA and LTMA) would reduce the CVFPP's impact to a less-than-significant level.

The related projects, particularly those water-related planning efforts that would increase areas of surface water (e.g., increased floodplain), could also cause mosquito habitat to increase, and there is no way to determine whether related projects would include mitigation measures to reduce those impacts. However, mosquito and vector control districts typically take an active role in reducing risk of mosquito-borne diseases, either by working with project proponents to minimize risk through modifications to project design and/or by minimizing risk after project implementation (e.g., planting mosquito fish (*Gambusia* sp.) or utilizing other vector controls). Therefore, a significant cumulative impact related to hazards from increased risk of mosquito-borne diseases is unlikely, and the proposed

program's contribution after mitigation would not result in a cumulatively considerable contribution to a significant cumulative impact related to this issue.

Hydrology

The cumulative context for hydrology is defined as the Extended SPA and the Sacramento and San Joaquin Valley watersheds. The cumulative context for flood management resources is limited to the Extended SPA.

The purpose of the proposed program is to improve flood management, thereby reducing the frequency of the damage caused by flooding. Implementing some individual NTMAs or LTMAs might somewhat alter the existing course of a stream or river (e.g., widen the floodway with a setback levee). However, implementing the overall proposed program would not increase flooding on or off site, other than as part of intended floodway expansion, such as where land currently receiving flood protection is placed within a new flood bypass. Individual NTMAs or LTMAs would not be implemented or approved if water surface elevation, and thus the potential for flooding, would increase above the maximum allowed rise set by the U.S. Army Corps of Engineers or the Central Valley Flood Protection Board. The project proponent for any NTMA or LTMA would need to obtain permits and approvals, such as Section 408 and 208.10 and Central Valley Flood Protection Board encroachment permits, to be able to implement the project. These permits require that there be no increase in flooding. Hence, any flooding impacts associated with a specific activity would need to be mitigated and the project would need to be modified before implementation.

In addition, implementing NTMAs or LTMAs would not increase the rate or amount of surface runoff in a manner that would substantially increase the risk of flooding, locally impede flow, or transfer flood risk to downstream areas. Under LTMAs, providing additional flood storage via widened floodways or bypasses or new bypasses would temporarily hold water that otherwise would have posed a more immediate flood risk to downstream areas. Implementing LTMAs would result in beneficial effects because the overall flood system's conveyance would be improved, thereby lowering flood risk, including the risk associated with redirected flood flows.

The related water projects may also contain components that are intended to reduce the overall risk of flooding. In that sense, the proposed program and the related water projects would result in beneficial impacts on flood management resources. Therefore, the program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to flood risk.

The proposed program and the related water projects would not entail residential construction, and thus homes would not be placed within a designated 100-year flood hazard area. Implementing the NTMAs and LTMAs would provide a higher level of flood protection for some areas currently protected by facilities of the State Plan of Flood Control. Providing a higher level of flood protection could potentially cause the boundaries of some flood hazard areas to change, which would cause existing homes in those areas to no longer be within a flood hazard area. The land use–related policy changes in NTMAs and LTMAs would discourage construction of new homes in a flood hazard area. Further opportunities to construct new homes within a 100-year flood hazard area would be removed where flood, conservation, or other easements are purchased. (See Section 3.14, "Land Use and Planning," for further discussion of the potential for policies on the applicable level of flood protection to alter residential land use patterns.) Therefore, this effect would be beneficial and the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to placing homes in a designated 100-year flood hazard area.

Implementing some NTMAs or LTMAs could change the existing hydraulics of the affected river systems, increasing erosion or siltation. As a result of these hydraulic changes, the rivers and streams may be subject to changes in the duration, depth, or velocity of flows, which could increase waterside erosion or siltation. Changes in flows from NTMAs would not be sufficient to result in a significant adverse effect. The combination of reoperating reservoirs, widening floodways, and operating floodplain storage areas under LTMAs could increase erosion to a greater degree and could result in a significant impact. Implementing Mitigation Measure HYD-1 (LTMA) would reduce this impact to a less-than-significant level by identifying and implementing measures to minimize downstream erosion and siltation. The related projects as they pertain to flood control are designed to minimize erosion as part of the projects themselves; the remaining related projects are required to develop and implement best management practices and SWPPPs to reduce erosion. Therefore, the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to increased erosion.

Neither the proposed program nor the related water projects would place facilities in areas that would be subject to inundation by seiche or tsunami. Because the proposed program would not result in a seiche or tsunami inundation hazard, the program also would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to this topic.

As described in Section 2.6, "No Near- or Long-Term Reduction in Water or Renewable Electricity Deliveries," the proposed program would not result in long-term reductions to water deliveries to the SoCal/coastal CVP/SWP service areas. For reasons similar to those described in Section 2.6, the proposed program would not result in reductions in available water in other portions of the study area. Therefore, the proposed program would also not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to water supply.

Land Use and Planning

The cumulative context for land use and planning consists of the cities and counties within the Extended SPA and the Sacramento and San Joaquin Valley watersheds. Section 3.14, "Land Use and Planning," describes the historic and existing land uses in the study area. The cities and counties in the Extended SPA are shown in Figures 3.14-1a and 3.14-1b, and the cities and counties in the Sacramento and San Joaquin Valley watersheds are shown in Figure 3.14-2.

Implementing conveyance-related, storage-related, and other NTMAs and LTMAs would not result in the physical division of an established community; the proposed program would not contribute to a cumulative impact on this basis.

Implementing conveyance-related, storage-related, and other NTMAs and LTMAs would alter agricultural and recreational land uses, resulting in changes to those land use patterns that would cause potentially significant and significant adverse physical environmental effects. The cumulative land use impacts associated with changes in patterns of agricultural and recreational land uses would be the same as the cumulative impacts discussed above in "Agriculture and Forestry Resources" and below in "Recreation," respectively. Implementation of Mitigation Measures LU-5a, LU-5c, and LU-5d (NTMA and LTMA) would reduce significant impacts associated with the removal of residences and changes in recreation land uses to a less-than-significant level. Implementation of Mitigation Measures LU-5b and LU-8 (NTMA and LTMA) would lessen the significant impact associated with changes in agricultural land use patterns, but not to a less-than-significant level. Even with implementation of Mitigation Measures LU-5a through LU-5c and LU-8 (NTMA and LTMA), the proposed program would contribute to changes in patterns of agricultural and recreational land uses that would result in adverse physical effects on the environment, which are already occurring even without the project. Therefore, implementing the proposed program would result in cumulatively considerable incremental contributions to cumulatively significant impacts related to agricultural and recreational land uses.

California's planning laws delegate the authority over land use and land use planning to local jurisdictions. The nature and extent of changes made to local land use plans or development permitting processes in response to statutorily established 2007 flood legislation requirements for the applicable level of flood protection would be determined by local planners and decision makers in jurisdictions throughout the Central Valley. Statutorily required amendments to land use plans and zoning codes are policy-related and regulatory effects on land use regulation, rather than physical environmental effects in and of themselves; therefore, adoption of such amendments would not be considered direct impacts of the CVFPP. As a result, implementing the proposed program would not directly result in cumulatively considerable incremental contributions to a cumulatively significant land use impact.

Implementing statutorily established 2007 flood legislation requirements for the specified levels of flood protection could indirectly change land uses and/or patterns of land use, should cities or counties be unable to provide adequate flood protection and instead choose to redirect land uses and new development to less flood-prone areas. The effects of such changes could be environmentally adverse or beneficial, depending on the nature of future land use planning undertaken by local agencies and jurisdictions with land use authority. It is currently unknown which cities and counties would revise their land use plans to redirect land use and development away from flood-prone areas, and to what extent these changed plans would result in adverse or beneficial environmental effects; therefore, no further analysis is possible. Thus, because a reasonable conclusion cannot currently be reached about the potential for adverse environmental effects to result from redirecting land use and development to comply with the requirements for the urban level of flood protection, this impact is too speculative to make a significance determination.

Noise

The cumulative context for noise is the Extended SPA and the Sacramento and San Joaquin Valley watersheds, where noise receptors and generators are expected to be affected by the proposed program. Section 3.15, "Noise," describes the fundamentals of noise and vibration and the existing noise environment in the study area. It also identifies the types of sensitive receptors that may potentially be affected by noise with implementation of the proposed program. Noise and vibration are localized occurrences that attenuate rapidly with distance. Therefore, only future development projects and flood control projects in the immediate vicinity of the study area that occur at the same time as noise- and vibration-generating program activities would have the potential to add to noise and vibration generated by program activities, thus resulting in cumulative noise and vibration impacts.

Construction activities could potentially expose sensitive receptors to noise levels in excess of the applicable noise standards and/or result in a substantial increase in ambient noise levels. However, traffic noise levels under the proposed program are not expected to increase to a level that would result in exceedence of applicable thresholds.

Implementing noise-reducing construction practices (Mitigation Measure NOI-1 (NTMA and LTMA)) would reduce potentially significant noise impacts associated with construction activities to a less-than-significant level. The related projects could also result in construction noise that has the potential to exceed local noise ordinances. However, to result in a cumulative noise impact, construction of a related project would need to occur at the same time as and close to construction of an NTMA or LTMA. In addition, many local noise ordinances provide special provisions for construction-related noise, allowing construction activities to be considered in compliance with the ordinance even if the noise generated exceeds the standards applied to other activities. The separate treatment of construction noise is often an acknowledgment that construction noise is temporary, that reducing noise levels below a particular threshold is frequently infeasible because of the high noise levels inherent in operation of construction equipment, and that construction often must occur near sensitive receptors. Some jurisdictions also make special provisions allowing nighttime construction to occur without considering such construction a violation of applicable noise regulations. Where local noise ordinances applicable to a project allow for such provisions, compliance with the ordinance can be considered sufficient mitigation and an indication of a less-than-significant impact. Therefore, even if an NTMA or LTMA were constructed at the same time as and close to construction of a related project, construction noise would not exceed local standards. Given these conditions, the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to construction noise.

Construction activities in the study area may result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and the operations involved. Specific NTMAs and LTMAs, and thus the vibration-generating equipment that would be used, are unknown at this time. Sensitive receptors could be exposed to groundborne vibration levels that could exceed the acceptable vibration standards of the California Department of Transportation or Federal Transit Administration. Implementing Mitigation Measure NOI-2 (NTMA and LTMA) would reduce this potentially significant impact to a less-than-significant level because project proponents would implement vibration-reducing measures before and during construction activities that occur within 300 feet of a receptor sensitive to vibration disturbance. For a

cumulative vibration impact to occur, construction activities generating groundborne vibration from a related project would need to occur at the same time as and very close to construction activities for an NTMA or LTMA generating groundborne vibration. Groundborne vibration attenuates very quickly, dissipating over short distances (i.e., hundreds of feet for unmitigated vibration sources), resulting in the requirement that vibration sources be very close together to interact in a cumulative manner. For vibration impacts mitigated to a less-than-significant level, extreme proximity between two sources would be required for a cumulative effect to occur. This scenario is highly unlikely, with vibration levels great enough to result in a significant cumulative impact being even more unlikely. Therefore, the proposed program would not result in a cumulatively considerable incremental contribution to a cumulative impact related to groundborne vibration.

Implementing NTMAs and LTMAs could generate long-term noise during operation of stationary noise sources (e.g., water pumps). Depending on the locations of management actions and the equipment needed for long-term operation, a new source of noise could be introduced near sensitive receptors. Specific NTMAs and LTMAs have not yet been defined; however, stationary-source noise levels could increase under the proposed program. Thus, introducing a long-term stationary-source noise under the program could expose sensitive receptors to noise levels that would exceed applicable noise standards. Mitigation Measure NOI-3 (NTMA and LTMA) would require that design techniques include measures to reduce operational noise. As a result, this potentially significant impact would be reduced to a less-than-significant level. Stationary-source noise associated with the related projects could potentially create noise levels that would exceed the applicable noise standards. These related projects consist primarily of flood control, habitat restoration, and air quality/climate action plans and urban development. The noise from any stationary noise sources associated with the related projects could be controlled at the source (by means of noise walls, enclosures, site planning, and so on) to meet local noise standards; however, there is no guarantee that all the related projects would include such noise controls as part of their proposals. Hence, significant cumulative noise impacts associated with stationary noise sources could occur under the related projects. However, noise levels are not directly additive and attenuate rapidly with distance. Stationary-source noise would be localized, particularly mitigated low-level noise from NTMAs and LTMAs and would be unlikely to combine with noise from other projects in the region to produce cumulative noise impacts. Therefore, the proposed program would not result in a cumulatively considerable incremental contribution to a cumulative noise impact related to stationary noise sources.

Population, Employment, and Housing

The cumulative context for population, employment, and housing consists of the cities and counties within the Extended SPA and the Sacramento and San Joaquin Valley watersheds where the proposed program could result in construction or increases in operational and maintenance-related activities that could induce population growth. The existing and projected population, employment, and housing in these cities and counties are described in Section 3.16, "Population, Employment, and Housing."

Multiple NTMAs and LTMAs could be implemented concurrently, but projects would be implemented throughout the Central Valley, and economic activity (and thereby growth) would likely not be concentrated in any one area. The sizes of construction crews would vary, but crews are not expected to be large enough to exhaust local labor markets and attract substantial numbers of new residents. This is particularly the case because the current economic downturn, which has resulted in higher-than-normal levels of unemployed workers in the construction sector, is projected to continue for several years into the future. For construction activities, increases in socioeconomic activity would be localized and short term, lasting as long as a particular project's construction period. In many instances, construction jobs would be filled by local employees, with projects needing to be particularly large or particularly remote to require employees from outside a reasonable daily commute distance. Related projects would be expected to result in similar impacts with similar results as far as construction jobs being filled by the existing available labor pool. Therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to substantial population growth from construction activities.

Operation and maintenance of NTMAs and LTMAs could also generate new jobs, economic activity, and therefore, population growth. However, NTMAs and LTMAs would not require extensive staff for operations and maintenance. A handful of full-time employees can operate and maintain many miles of levees and other flood control facilities. Any increases in operations and maintenance jobs could be filled by local employee pools, resulting in little to no change in population growth in the area. Related flood control projects that would involve operating and maintaining new facilities would be expected to result in similar impacts. Many of these projects would entail some number of employment opportunities, which would likely be filled by local employee pools; therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a cumulatively significant impact related to substantial population growth from operational activities.

Reasonably foreseeable population growth in the Extended SPA and the Sacramento and San Joaquin Valley watersheds is planned for in city and county general plans. Population projections are generally based on assumptions about expected development trends within the city limits and proposed city spheres of influences or planning areas and within county boundaries. The related projects could result in significant impacts related to substantial population growth from future urban development within the study area if any projects, or combinations of projects, were to result in growth significantly greater than anticipated in city and county general plans. Section 3.16 of this PEIR provides current and future population trends for counties within the Extended SPA and the Sacramento and San Joaquin Valley watersheds (see Table 3.16-1). For an impact related to population growth to be considered significant, the population growth would have to exceed planned growth for the region; thus, based on the projected growth rates for 2010–2030, annual population growth in any one county and/or planning area exceeding 2.0 to 3.0 percent would likely result in a significant impact. However, given the conditions described above, it is not expected that construction-related and operational activities for NTMAs and LTMAs would generate sufficient population growth to exceed the growth rates projected in the region. Given the temporary nature of construction jobs and the minimal job generation associated with operation and maintenance of program facilities, even the combined construction and operation of all the projected NTMAs and LTMAs, when considered in combination with the related projects, would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to substantial population growth.

Substantial numbers of housing and/or people would not be displaced with implementation of the NTMAs or LTMAs because new flood control facilities would be constructed in rural areas where there are few residential land uses and existing facilities would typically be repaired and reconstructed in place. In addition, land uses would not change so dramatically that homes would have to be destroyed to make way for new or improved flood management structures. Mandatory compliance with the National Flood Insurance Program or with policy changes requiring homeowners to pay for additional flood insurance may create a financial hardship for some families. Those families may find it more financially prudent to move out of the flood zone and avoid the requirement for flood insurance altogether. However, this scenario is projected to occur only in a few very limited cases. The related projects would be expected to result in similar impacts with similar results. Projects related to flood control, habitat restoration, and air quality/climate action plans typically do not result in displacement of substantial numbers of people. Therefore, the related projects are not expected to result in significant impacts involving displacement of substantial numbers of people. The proposed program

would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to this issue.

With regard to the potential to induce substantial unemployment, the various proposed NTMAs and LTMAs could both increase or decrease employment opportunities through mechanisms such as creating demand for construction jobs, increasing or decreasing operations and maintenance demands, preserving or reducing the number of agricultural jobs, and increasing or decreasing recreational opportunities. For example, the proposed program is expected to involve purchasing easements and developing habitat, which could take agricultural land out of production, thereby reducing local agriculture-related employment to some degree. Conversely, purchasing easements could also result in the preservation of agricultural land and restoring habitat could increase recreational opportunities, thereby increasing the availability of jobs serving the recreation sector. Overall, if implementing NTMAs and LTMAs were to result in a net decrease in jobs, the decrease would not be considered substantial, especially if considered on a countywide or regional level. The related projects would not be expected to result in substantial unemployment, for reasons similar to those described for the proposed program. Therefore, a significant cumulative impact related to unemployment is not expected to occur with implementation of the related projects. Implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact.

Public Services

In terms of cumulative impacts, providers of public services are responsible for ensuring that adequate services are provided within their jurisdictional boundaries. These boundaries range from local (e.g., city and county police and fire departments) to regional and statewide (e.g., the California Department of Forestry and Fire Protection's service districts). The geographic context for this analysis consists of those police and fire service providers that operate within the Extended SPA and the Sacramento and San Joaquin Valley watersheds. Section 3.17, "Public Services," describes police and fire services within the study area.

The potential for construction-related and operational activities associated with NTMAs and LTMAs to result in a need for increased fire or police protection services, such as additional officers and equipment, is remote because adequate service is typically provided in the region by local county and city service departments and NTMAs and LTMAs would generate little to no demand for additional services. With regard to demand for fire protection services, NTMAs and LTMAs would be conducted in compliance with OSHA standards, which require development and

implementation of a project-specific fire protection program. Therefore, implementing the proposed program would result in less-than-significant impacts on the need for increased fire or police services. Related flood control and restoration projects would result in similar less-than-significant impacts. Therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the provision of fire and police protection services.

Recreation

The cumulative context for recreation is defined as the Extended SPA and the Sacramento and San Joaquin Valley watersheds. Recreational facilities in the study area are described in Section 3.18, "Recreation." Various recreational opportunities and facilities are provided in the Sacramento and San Joaquin Valley and foothills by large multipurpose reservoirs on the Sacramento and San Joaquin rivers and their major and minor tributaries. Recreation is not among the original purposes of most of the reservoirs; however, all these reservoirs provide water-based, water-related, or water-enhanced recreation opportunities (e.g., camping, picnicking, hiking, and boating) and recreation facilities accessible to the public. The Sacramento and San Joaquin rivers and their tributaries provide river-based recreational opportunities, including fishing, boating, and whitewater rafting. Numerous water-based recreation opportunities are available in the Delta, including boating and fishing. The watersheds of the Sacramento and San Joaquin valleys include numerous federal, State, regional, and local lands and recreation facilities that provide land-based recreation opportunities, such as hiking, camping, wildlife viewing, bird-watching, and hunting. These areas often contain a range of developed recreation facilities, such as campgrounds, picnic areas, visitor centers, boat ramps and marinas, and trails.

Facilities associated with NTMAs and LTMAs may displace existing recreational facilities or reduce existing access to recreation. Existing recreational facilities could be removed, or potentially integrated into flood control facility improvements or repairs or new flood control facilities. NTMAs and LTMAs could also limit access to existing facilities by displacing existing access roads, trails, or parking areas. Existing alternative recreation facilities and opportunities in an affected area may be unavailable or inadequate for the level of demand generated by the loss of facilities caused by the proposed program. Therefore, these management activities may result in a substantial reduction in recreation opportunities that could require construction of replacement facilities elsewhere. Implementing Mitigation Measures REC-1 (NTMA and LTMA) and REC-7 (LTMA) would reduce potentially significant impacts to a less-than-significant level by replacing displaced recreation facilities and access. The

related projects could result in similar recreation impacts, and because there is no guarantee that the related projects would include mitigation measures to replace recreation facilities and access, the related projects could result in significant impacts. However, the proposed program would ensure the replacement of any displaced recreational facilities or access. Thus, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the displacement of recreational facilities.

Temporary construction-related activities may conflict with the ability of recreationists to use or access recreation facilities or engage in recreation activities during the construction period. However, these effects would be infrequent, temporary, and short term, occurring only during the period when NTMA or LTMA construction activities take place near a recreation facility. In almost all instances, other similar recreation opportunities would be available in a region during construction. Given these conditions, this impact would be less than significant. However, Mitigation Measure REC-2 (NTMA and LTMA) is provided to further reduce this impact by directing that construction activities and staging be avoided near recreational facilities and that such activities be timed to avoid the high-use recreation season. The related projects could result in similar construction-related recreation impacts. Effects on recreation resources typically are infrequent, short term, and temporary; however, there is no guarantee that some related projects may not have substantially longer construction periods, thus resulting in a more severe impact, and that they would include mitigation measures to avoid conflicts with recreational use during construction. Therefore, some related projects could result in significant impacts. However, the proposed program would ensure that construction activities do not substantially affect recreation access. Thus, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to this issue.

Changing the operations of existing reservoirs could also alter the amount and timing of the annual reservoir drawdown, which could reduce access to recreational facilities and opportunities for recreation. Increasing reservoir drawdown may affect the functionality and capacity of recreational facilities such as boat ramps or marinas, and may reduce the length of time when these facilities are available to the public each year. Conversely, reduced drawdown may enhance recreational access and use by maximizing the amount of reservoir shoreline and surface area available for recreation and maximizing boat access to shallow bays and coves. However, these changes in reservoir operations are expected to be minimal, and therefore would result in less-than-significant impacts for both NTMAs and LTMAs. In addition, it would be rare for this very location-based effect

to interact with a related project. Implementing reservoir reoperation elements of the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to recreational facilities at reservoirs.

Conducting construction activities from barges in waterways would cause temporary boat navigation hazards and restrict passage by recreational boat traffic. Implementing Mitigation Measure REC-4 (NTMA and LTMA) would reduce potentially significant impacts to a less-than-significant level because safe boat passage would be maintained and appropriate safety measures would be provided to minimize navigation hazards posed by construction equipment and activity in waterways. The related flood control projects may also entail conducting construction activities from barges in waterways. Because there is no guarantee that the related projects would include mitigation measures to ensure that recreational boat traffic is not impeded, the related projects could result in significant impacts. However, given the large amount of water-based recreation within the Extended SPA and the localized, short-term nature of barge transport, the limited amount of barge-related construction from the proposed program in combination with the related projects is not expected to result in substantial impacts on recreation. Therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to boating hazards.

In certain cases, implementing aspects of the VMS may cause woody vegetation, including shade trees, to be eliminated from levees within the identified vegetation management zone. Where woody vegetation would be removed from levees and adjacent levee toes, the area's attractiveness for terrestrial recreational activities such as boating, bank fishing, and wildlife viewing could decline. Although changes in vegetation conditions resulting from the proposed program could adversely affect the quality of some recreation activities in some areas, these effects would not be substantial because lower levee slopes and waterside vegetation would be unaffected in a vast majority of cases. Where the vegetation of most importance to recreation quality would be affected, on-site mitigation (for biological resources) to restore waterside woody vegetation would minimize the potential effects on recreation. In addition, adverse effects of removing vegetation in some areas would be offset in many cases by planting of riparian vegetation elsewhere. For related projects to add to this impact in a cumulative manner, they would need to result in removal of woody vegetation from levees above and beyond that assumed in the VMS. Because of the substantial permitting and mitigation requirements associated with removal of woody riparian vegetation, there is a substantial incentive for project proponents to minimize effects on woody riparian vegetation. Where woody riparian vegetation is removed, it must be

replaced, often at mitigation ratios greater than 1 to 1. Therefore, although past projects may have resulted in substantial cumulative regional reductions in woody riparian vegetation in the Extended SPA, this is highly unlikely to occur for future projects. Therefore, an adverse cumulative impact on recreation facilities and opportunities from removal of woody riparian vegetation would not occur. Implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to this issue.

Transportation and Traffic

The cumulative context for transportation and traffic is the Extended SPA because a majority of impacts are expected from construction-related activities adjacent to a project area. As discussed in Section 3.19, "Transportation and Traffic," Interstates 5 and 80, State Route 99, and U.S. Highway 50 are major transportation corridors that provide access throughout the Extended SPA. In addition, other local State routes individually serve the Sacramento and San Joaquin Valley and foothills and the Delta. Levee roads are located throughout the Central Valley, with a large concentration of them in the Delta. Particularly in the Delta, levees surround and protect a large number of islands or tracts, with levee roads and bridges connecting these islands.

Construction activities associated with NTMAs and LTMAs have the potential to temporarily increase traffic in the areas adjacent to construction zones and over any haul routes. Construction and ground-disturbing activities associated with NTMAs and LTMAs also may require construction workers to drive to site locations and trucks to deliver materials and fill (if needed) and remove debris. As a result, construction of NTMAs and LTMAs may result in substantial (although temporary) increases in traffic on nearby roadways. Mitigation Measure TRN-1 (NTMA and LTMA) would require that traffic-reducing construction measures be implemented to minimize interference to local and regional traffic flows from construction activities. This mitigation measure would be sufficient to reduce this impact to a less-than-significant level for NTMAs; however, because of the larger construction effort associated with some LTMAs, a less-than-significant conclusion after mitigation cannot be assured for all LTMAs.

Temporary increases in traffic and reductions in roadway capacity would also result from construction activities for various related projects in the study area. Those impacts would be evaluated in the environmental review documents for the projects with which the impacts would be associated, and they would be mitigated to the extent feasible. However, traffic impacts are very site specific, and certain roadway segments or intersections could be near their operating capacity. Adding traffic from

multiple projects, even if each contribution were individually less than significant, could result in a substantial degradation of roadway or intersection operations. If an NTMA or LTMA were constructed close to a related project at the same time that construction of the related project was under way, a substantial cumulative increase in traffic levels could occur. Given these conditions and the potential for large LTMAs to result in a significant and unavoidable impact related to temporary construction traffic, implementing the proposed program would result in a cumulatively considerable incremental contribution to a significant cumulative impact related to temporary increases in traffic from construction activities.

Existing transportation infrastructure may be removed or temporarily disrupted as a result of some NTMAs and LTMAs. Some roads, rail lines, or bicycle paths may need to be completely or temporarily closed to accommodate construction activities. Infrastructure would be most likely to be removed in rural areas where new flood control structures would be constructed or easements would be purchased. It is unlikely that any major transportation corridors would be located in the areas being proposed for these actions, but some smaller local roads may be present. Implementing Mitigation Measure TRN-2 (NTMA and LTMA) would require the project proponent to provide convenient detours to closed or disrupted routes by implementing a traffic plan. This mitigation measure would reduce impacts associated with small and medium-sized program activities to a less-than-significant level. However, for larger projects, even with mitigation, these impacts could be significant and unavoidable. Consequently, implementing the proposed program could result in a cumulatively considerable incremental contribution to a significant cumulative impact related to the removal or temporary disruption of transportation infrastructure.

Construction activities may require temporary lane reductions or changes to roadway alignments to accommodate contractor work areas. These temporary alterations to roadway operations could generate safety hazards for motorists, pedestrians, and bicyclists. However, standard traffic control measures such as signage and flagpersons would be included in all construction activities. With implementation of these standard contractor requirements and enforcement of speed limits in construction zones, impacts related to transportation safety hazards during construction of NTMAs and LTMAs would be less than significant. Many of these standard traffic management measures are required by local jurisdictions for issuance of building permits and/or temporary access easements or road rights-of-way. Therefore, it is anticipated that similar measures to reduce transportation hazards during construction would be implemented for all related projects. With construction-related transportation safety hazards addressed both on a project-by-project basis and on a broader level by local jurisdictions, a significant cumulative impact is not expected to occur. The

proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to increased transportation hazards due to construction.

NTMAs and LTMAs may require the temporary or partial closure of roads. Many of the management actions are tied to levees, where both emergency response and evacuation routes are limited. Standard procedures require preservation of both emergency response and evacuation routes at all times. However, because construction activities could temporarily disrupt an emergency response or evacuation route, a potentially significant impact would occur. This impact would be reduced to a less-than-significant level for both NTMAs and LTMAs with implementation of Mitigation Measure TRN-4 (NTMA and LTMA), which requires coordination and consultation with emergency response agencies to maintain acceptable levels of passage for emergency response vehicles and for evacuations. Such coordination is a typical practice for construction projects and is often required by local jurisdictions. Therefore, similar less-than-significant effects on emergency response and evacuation routes would be expected for all related projects. Therefore, a significant cumulative impact related to this issue is not expected to occur. The proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact.

Expanding the footprint of existing flood protection facilities, building new facilities, and purchasing easements could interfere with local agencies' adopted plans for bicycle and pedestrian facilities. However, improvements to bicycle and pedestrian facilities can often be integrated into flood protection projects (e.g., by constructing or reconstructing a segment of bike path on a seepage berm), thus allowing current use of facilities to continue or construction of facilities included in agency plans. Project proponents would be expected to consult with appropriate local agencies to minimize the impacts of NTMAs on future agency plans for bicycle and pedestrian infrastructure. Given the ability to incorporate bicycle and pedestrian facilities into the design of many NTMAs and LTMAs and the flexibility available for routing and locating many bicycle and pedestrian facilities, the potential for irreconcilable conflicts between these two uses is minimal; thus, this impact would be less than significant. Potential conflicts between flood protection facilities and pedestrian and bicycle infrastructure are a highly localized issue. For example, where a seepage berm might conflict with an existing or planned bicycle path, it is highly unlikely to be influenced by related projects because these other projects would not be permitted on the seepage berm. It is highly unlikely that related projects would interact in an additive or cumulative way relative to potential conflicts with adopted policies, plans, or programs regarding bicycle and pedestrian facilities. Therefore, no cumulative impact would occur, and the

proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to this topic.

Utilities and Service Systems

In terms of cumulative impacts, the utility and service providers within the Extended SPA and the Sacramento and San Joaquin Valley watersheds are responsible for ensuring that adequate capacity and service systems are provided within their jurisdictional boundaries. Utility and service system infrastructure is located throughout the study area and is owned, operated, and maintained by the public and private service providers described in Section 3.20, "Utilities and Service Systems." Solid waste facilities are operated by private entities and public agencies that contract with counties and cities for receipt of solid waste. Cumulative impacts related to demand for natural gas and electricity are addressed above in "Energy," and the cumulative impacts on groundwater and surface water supplies are addressed respectively in "Groundwater Resources" and "Hydrology."

Construction-related activities under NTMAs and LTMAs, including grading and excavation, could encroach on multiple types of utility equipment and facilities: storm drains, irrigation lines, electric power lines, gas pipelines, and communications systems. These activities may damage or require relocation of existing utility infrastructure, interrupt utility services, or otherwise affect the ability of service providers to quickly repair damage and/or restore interrupted service. These impacts would occur on a project-specific basis; mitigation under NTMAs and LTMAs would require consultation with service providers and implementation of appropriate protection measures (Mitigation Measure UTL-1 (NTMA and LTMA)), which would reduce potentially significant impacts to a less-than-significant level. Similar types of consultation, coordination, and protection measures would be implemented for related projects because these are standard construction practices (e.g., Underground Service Alert's "Check Before You Dig" program) and are often required by local jurisdictions and other entities as part of construction authorizations. It is highly unlikely that an NTMA or LTMA would cause a substantial disruption in utility service to a particular set of customers, and that a related project would then cause another substantial disruption of service for the same utility to the same set of customers within a similar time frame. A significant cumulative impact related to this issue would not occur, and the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to disruption of utility service. In fact, implementing the proposed program would increase flood protection for utility infrastructure within the Extended SPA, minimizing incidents of utility service disruptions resulting from failures of the flood control system.

Construction associated with conveyance-related NTMAs and LTMAs would generate debris and waste in the short term. The landfills to be used for disposal of construction-related waste would be determined by the construction contractor at the beginning of construction, based on landfill capacity, types of waste, and other factors. Only those landfills determined to have sufficient available capacity to accommodate construction disposal needs would be used. The related projects vary in size and would generate different amounts of solid waste; disposal of solid waste would also occur at landfills determined to have sufficient capacity. In addition, conveyance-related NTMAs and LTMAs and related projects would be implemented in various geographic locations; therefore, no one landfill would accept all construction-related solid waste associated with conveyance-related NTMAs and LTMAs and related projects. As a result, a significant cumulative impact related to generation and disposal of construction waste would not occur. Implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to disposal of construction-generated debris and waste.

Water Quality

The cumulative context for water quality consists of the Extended SPA and the Sacramento and San Joaquin Valley watersheds. The surface water quality conditions of these areas are described in Section 3.21, "Water Quality." In general, water quality conditions during high-water events in the Extended SPA have historically been affected by two factors: potential increases in constituent loading associated with stormwater runoff, and increased sediment loading and turbidity resulting from bank and bed erosion. Pollutants commonly found in stormwater runoff include heavy metals, pesticides and fertilizers, oil and grease, bacteria, and sediment. Water quality often fluctuates over time and is influenced by climate, local agricultural diversions and drainage water, urban runoff, and discharges from wastewater treatment facilities. Salinity is also of concern; excessive salinity may adversely affect crop yields and require more water for salt leaching, may require additional municipal and industrial treatment, may increase salinity levels in agricultural soils and groundwater, and is the primary water quality constraint to recycling wastewater. As urban development has increased throughout California, water quality has been and continues to be adversely affected on a cumulative level by pollutants from urban runoff, agricultural runoff, discharges from wastewater treatment facilities, and other sources, resulting in significant adverse cumulative water quality impacts.

Short-term construction activities associated with NTMAs and LTMAs would involve grading and moving earth, which could result in soil erosion, stormwater discharges of suspended solids, and increased turbidity, and

could mobilize other pollutants from project-related construction sites. Intense rainfall and associated stormwater runoff in relatively flat areas could result in sheet erosion within areas of exposed or stockpiled soils for short periods of time. If uncontrolled, these soil materials could cause sedimentation and block drainage channels. Accidental spills of construction-related contaminants, such as fuels, oils, paints, solvents, cleaners, and concrete, could also occur during construction activities. However, each project proponent must prepare a SWPPP consistent with the existing statewide NPDES discharge permits from the appropriate RWQCB. The SWPPP and NPDES permit are specifically designed to reduce adverse effects on the water quality of streams and rivers. The proponent for each related project that would discharge stormwater runoff would also be required to prepare a SWPPP and comply with NPDES discharge permits from the appropriate RWQCB. Therefore, a significant cumulative impact would not occur. Implementing the proposed program's construction activities would not result in a cumulatively considerable incremental contribution to a significant cumulative impact.

Project proponents would be required to comply with applicable rules and regulations for water quality when implementing long-term operational NTMAs and LTMAs, including altering reservoir operations. Changes in reservoir operations included in the proposed program could lead to altered temperature regimes in downstream flows; could cause changes in relative concentrations of constituents in various river reaches, as more or less water is released with constituent concentrations that differ from existing downstream conditions; and could alter instream water chemistry or increase loading of certain contaminants. However, to alter reservoir operations, the project proponent would be required to comply with existing rules and regulations for water quality, such as total maximum daily loads. In addition, modifying reservoir operations could potentially improve water temperature and water quality beyond existing requirements by releasing colder water and providing pulse flows to support fish species. These changes would be beneficial. Because of the limited nature of reservoir operational changes under the proposed program, and because existing water quality rules and regulations would still apply to reservoir operations, any potential adverse effects would be minor and this impact would be less than significant. Only related projects that could affect water quality in waterways downstream from the reservoirs where operations would be modified could interact with the effects of reservoir operations to potentially generate a cumulative impact. Related projects that could affect water quality would be subject to the broad range of laws and regulations intended to protect water quality. Therefore, contributions to a cumulative adverse water quality effect would be minimal. Although existing water quality conditions indicate a significant cumulative adverse effect from past and present projects, future projects are unlikely to make a substantial

contribution to this effect. Similarly, modified reservoir operations included in the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative water quality impact.

Implementing NTMAs and LTMAs would alter the frequency, areal extent, and duration of floodplain inundation and may result in increased or decreased availability and mobilization of sediments and associated contaminants. These contaminants may include pesticides, nutrients, metals, or coliform bacteria. Altered floodplain inundation may also affect the bioavailability and transport of mercury. Alternatively, inundation of floodplains may allow sediments and contaminants already suspended in the water to settle out of the water before returning to the river, thus improving downstream water quality. The likelihood of an adverse impact on water quality would depend largely on past land uses, and would be determined during subsequent site-specific studies. Potentially significant adverse effects on water quality from altering floodplain inundation patterns would be reduced to a less-than-significant level with implementation of Mitigation Measure SWQ-3 (NTMA and LTMA). This measure requires Phase I Environmental Site Assessments to determine the presence or absence of hazardous material at all sites where new floodplain would be exposed to inundation and mandates cleanup of contaminants found during the assessment. If the contaminant is sufficient to exceed applicable regulatory thresholds, then the project proponent will ensure cleanup of the site, consistent with regulatory requirement. Because any contaminants present would be cleaned up and floodplains would be expanded only on limited occasions, any water quality impacts associated with altered floodplain inundation would be minimal and could potentially be offset by the water quality benefits of floodplain inundation. Therefore, implementing the proposed program would not result in a cumulatively considerable incremental contribution to a significant cumulative impact related to water quality effects from altered floodplain inundation.

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