Chapter 17

Cumulative Impacts, Growth-Inducing Effects, and Irreversible Commitment of Resources

17.1 Introduction

This chapter describes the cumulative impacts associated with the Lower San Joaquin River (LSJR) and southern Delta water quality (SDWQ) alternatives together with other projects (and programs) that could cause related impacts. In accordance with the California Environmental Quality Act (CEQA) Guidelines (California Code of Regulations [Cal. Code Regs.], tit. 14, § 15130) requirements, this chapter discusses the cumulative impacts of the LSJR and SDWQ alternatives in conjunction with other past, present, and reasonably foreseeable probable future projects. Present and reasonably foreseeable probable future projects are projects that are currently under construction, approved for construction, have submitted a request for approval or review by an agency, or are in the final stages of formal planning.

This chapter provides an analy**s**is of the potential cumulative impacts, organized by resource area, which would result from the implementation of the proposed project (the LSJR and SDWQ alternatives, or plan amendments) and the other projects, described in Section 17.2.1, *Projects Considered*, of this chapter. The resource areas correspond with the resource chapters (Chapters 5–14) of this recirculated substitute environmental document (SED). The cumulative impacts associated with the No Project Alternative (LSJR/SDWQ Alternative 1) are discussed in Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1)*. The cumulative impacts associated with other indirect and additional actions are discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*.

This chapter also fulfills the CEQA requirement to describe the growth-inducing impacts of a proposed project. This chapter discusses the ways in which the LSJR and SDWQ alternatives could directly or indirectly foster economic or population growth or the construction of additional projects. (Cal. Code Regs., tit. 14, §15126.2, subd. (d).)

Finally, this chapter fulfills the CEQA requirement to disclose any significant irreversible environmental changes that could potentially result from implementation of the LSJR and SDWQ alternatives. (Cal. Code Regs., tit. 14, § 15126.2, subd. (c).)

17.2 Cumulative Impacts

17.2.1 Projects Considered

Cumulative impacts are defined in the State CEQA Guidelines as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." (Cal. Code Regs., tit. 14, § 15355.) A cumulative impact from several projects is "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonable foreseeable probable future

projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time." (Cal. Code Regs., tit. 14, § 15355, subd. (b).)

Overall, the LSJR alternatives would generally increase the instream flow requirements above baseline conditions. The principal potential impacts of the LSJR alternatives stem from the following factors.

- Reduced availability of surface water for agricultural, municipal, and other uses that result from requiring unimpaired flows[1] to remain in the stream system for the protection of fish and wildlife.
- Changes in timing and magnitude of flows in the plan area and reduced surface water availability for diversion that in turn have effects on groundwater.
- Changes in the timing and magnitude of flows that affect reservoir levels and riverine systems.

The cumulative analysis considers adverse effects of the project identified in the resource chapters that are significant or less than significant. If an impact has been determined to have no effect, then it would not contribute to any cumulative effects and it is not discussed in this chapter.

As described in the respective resource chapters (Chapters 5–14), LSJR Alternatives 3 and 4, with or without adaptive implementation, would have a significant and unavoidable impact on the following resources in the plan area.

- Groundwater resources
- Recreational resources and aesthetics
- Agricultural resources
- Service providers
- Energy and greenhouse gases

LSJR Alternative 2 with adaptive implementation would have a significant and unavoidable impact on groundwater, agriculture, and service providers in the plan area. LSJR Alternatives 2, 3, and 4 with or without adaptive implementation would have a less-than-significant effect on the other resources addressed in this SED, each of which is also evaluated in this chapter.

SDWQ Alternative 2 would have a significant and unavoidable impact on service providers. SDWQ Alternatives 2 and 3 would have a less-than-significant impact on surface hydrology and water quality, agricultural, and energy and greenhouse gases. SDWQ Alternatives 2 and 3 would have no impact on the other resources evaluated in Chapters 5–14 this SED.

The principal effect of SDWQ Alternative 2 would stem from the potential need of wastewater treatment plant operators to construct new wastewater treatment facilities or expand existing facilities to comply with salinity objectives. The construction of new wastewater treatment facilities or expansion of existing facilities or infrastructure could cause significant environmental effects and, thus, have a significant and unavoidable impact on service providers. The indirect environmental effects, cumulative and otherwise, of these new or expanded facilities or infrastructure are

[1] *Unimpaired flow* represents the water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds. It differs from natural flow because unimpaired flow is the flow that occurs at a specific location under the current configuration of channels, levees, floodplain, wetlands, deforestation and urbanization.

separately evaluated in Chapter 16, *Evaluation of Other Indirect and Additional Actions*. Statements in this chapter that an SDWQ alternative will have no impact pertains to the impact questions evaluated in Chapters 5–15 of the SED.

As described in the respective resource chapters, LSJR Alternatives 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation would have a significant and unavoidable impact on the following resources within the extended plan area.

- Aquatic biological resources
- Terrestrial biological resources
- Recreational resources and aesthetics
- Service providers
- Energy and greenhouse gases

LSJR Alternatives 2, 3, and 4 with or without adaptive implementation would have a less-than-significant effect on the other resources in the extended plan area.

The SDWQ alternatives would not have impacts in the extended plan area because (1) flows in the extended plan area are not expected to change in response to the SDWQ alternatives, and (2) the extended plan area is far upstream from the southern Delta, which means that any change in the salinity conditions in the southern Delta would not affect the water quality in the extended plan area. As such, no cumulative impact is associated with the SDWQ alternatives in the extended plan area and, therefore, are not discussed further in this chapter.

As discussed in Chapter 15, the No Project Alternative (LSJR/SDWQ Alternative 1) would have significant and unavoidable impacts on the following resources.

- Surface hydrology and water quality
- Aquatic biological resources
- Terrestrial biological resources
- Recreational resources and aesthetics
- Agricultural resources
- Cultural resources
- Service providers
- Energy and greenhouse gases

The No Project Alternative would have a less-than-significant effect on the other resources addressed in this SED.

The proposed plan amendments are analyzed at a programmatic level of detail in this cumulative effects analysis. Responsibility for implementing the objectives will be assigned in future proceedings and evaluated on a project-level basis in accordance with CEQA. Where information is not sufficient for a detailed cumulative effects analysis, or there is a high level of uncertainty as to what actions would occur and how they would affect resources, this is noted in the text and no attempt at speculation is made.

Projects with Potential Cumulative Impacts

Table 17-1 lists and describes specific projects, or categories of projects, that could have a cumulative impact and why. The description of the potential impacts of the LSJR and SDWQ alternatives on each resource is in the respective resource chapter (Chapters 5–14). Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1)*, describes the impacts of the No Projects Alternative, including cumulative impacts.

This cumulative impact evaluation considers past projects, present projects, and reasonably foreseeable probable future projects with related effects in the San Joaquin River (SJR) Basin (including the three eastside tributary watersheds—the Stanislaus, Tuolumne, and Merced Rivers), the southern Delta, and Delta. *Present and reasonably foreseeable probable future projects* are those projects that currently exist or are sufficiently certain to allow for a meaningful analysis, such as projects that are currently under construction, approved for construction, have submitted a request for approval or review by an agency, or are in the final stages of formal planning. Cumulative effects from past projects are generally reflected in the existing environmental conditions described in the resource chapters and provide context for the geographic area of environmental effects that are included in the cumulative impact analysis.

A number of past and present projects which affect flows in the LSJR and Delta are included in baseline. However, due to their dynamic nature all possible future effects may not be fully represented by the baseline. Given their potential to have different effects due to changing conditions, the cumulative effects of the following projects, described in Table 17-1, are also considered.

- National Marine Fisheries Service (NMFS) Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project (CVP) and State Water Project (SWP) (NMFS BO)
- United States Fish and Wildlife Service (USFWS) Biological Opinion on the Long-Term Operations of CVP and SWP (USFWS BO) (delta smelt)

Table 17-1 also includes categories of projects, with examples, so that the cumulative effects of a general class of projects can be determined. For example, water transfers are included as a general category of past, present, and reasonably foreseeable probable future projects that could have a cumulative effect. While water transfers are considered reasonably foreseeable, they are temporary in nature and can vary widely year-to-year. Historically, 1–2 water transfers of approximately 4–25 thousand acre-feet (TAF) occur annually within the plan area, as defined in Chapter 1, *Introduction*. These historical water transfers can be used to estimate the frequency and volumes of transfers that may occur in the future.

Table 17-1. Cumulative Project List

Project: California High Speed Rail Project

Status: Future—project development is ongoing

Location: San Francisco Peninsula, Santa Clara Valley, San Joaquin Valley, Antelope Valley, San Fernando Valley, and Los Angeles Basin

Project description: This project would involve the planning, design, construction, and operation of a high speed rail system connecting major population centers across California. Phase 1 of the project would run from San Francisco to the Los Angeles Basin (to be completed by 2029). Phase 2 of the project would extend the system to Sacramento and San Diego (no scheduled completion date). Once completed, the system would have up to 24 stations covering 800 miles. Construction of the system could create thousands of jobs and boost economic development across the state, encouraging population growth. Once completed, the project would improve environmental quality by reducing greenhouse gas (GHG) emissions from other forms of transportation.

Resource areas with potential cumulative effects:

- Groundwater resources
- Agricultural resources
- Service providers
- Energy and greenhouse gases

This project is expected to encourage population growth. This could increase water use in the region, which has historically relied on groundwater supplies. Therefore, it can be presumed that increased water demand would increase groundwater pumping, thereby affecting groundwater resources, reducing water availability for agricultural uses, and requiring service providers to meet the increased water demand. In addition, while the completed project is expected to reduce GHG emissions, construction would rely on considerable use of heavy equipment and construction vehicle trips, which could lead to increased GHG emissions. Thus, the project could have a related effects as the plan amendments on groundwater, agriculture, service providers, and energy and greenhouse gases.

Project: California WaterFix

Status: Future—project development is ongoing

Location: Delta

Project description: This project is proposed by the California Department of Water Resources (DWR) as a new State Water Project (SWP) Delta facility that would include three new screened intakes on the Sacramento River in the northern Delta, each capable of diverting up to 3,000 cubic feet per second (cfs) of water. This project would make physical and operational improvements to the SWP system in the Delta necessary to restore and protect ecosystem health, water supplies of the SWP and the Central Valley Project (CVP) south of the Delta, and water quality within a stable regulatory framework, consistent with statutory and contractual obligations. The Draft Bay Delta Conservation Plan (BDCP) and BDCP Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) were made available by DWR and the U.S. Bureau of Reclamation (USBR) for public review and comment in 2013. After consideration of the public comments, which included concerns regarding the effectiveness of certain habitat restoration measures and the level of scientific uncertainty regarding future conditions associated with climate change, DWR and USBR proposed a modified preferred alternative, Alternative 4A (i.e., "California WaterFix"), in 2015.

Alternative 4A includes the water conveyance facilities originally proposed but does not include the habitat conservation plan. It also uses a different regulatory approach for obtaining the permits and authorizations needed for implementation under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA). Alternative 4A is evaluated, along with other proposed alternatives, in the Recirculated Draft EIR/Supplemental Draft EIS (RDEIR/SDEIS) that was released on July 10, 2015 for public review and comment. On August 26, 2015, DWR and USBR filed an application with the State Water Resources Control

Board (State Water Board) for changes to their water rights permits that are needed to implement Alternative 4A. The water rights process will include public participation and the opportunity to comment; the evidentiary hearing on the petition began in July, 2016.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Aquatic biological resources
- Agricultural resources
- Service providers

This project could affect hydrodynamics (i.e., flow paths) and water quality in the Delta, including the southern Delta. If surface water is diverted in the northern Delta, in lieu of at the SWP Clifton Court Forebay and the CVP Jones Pumping Plant in the southern Delta, it could reduce the reverse flow effect that occurs when Sacramento River and San Joaquin River (SJR) flows are drawn south instead of moving west, as they would naturally, towards the San Francisco Bay. Reducing reverse flows would generally result in improved hydrologic conditions for aquatic species as both fish and food production are not drawn towards the southern Delta where chances of survival for at-risk native fish species diminish. However, drawing less Sacramento River water to the southern Delta could also result in increased salinity and generally reduced water quality in the southern Delta as Sacramento River water is less saline. In general, increased salinity could have a cumulative effect on surface hydrology and water quality, aquatic biological resources, agricultural resources, and service providers. Additionally, there could be construction-related impacts associated with the installation of new gates at Clifton Court Forebay in the southern Delta. However, specific cumulative effects of this project cannot be determined because the project will be affected by other projects, described in this table, which could also affect flows paths in the Delta and could have similar effects. These other projects include: National Marine Fisheries Service (NMFS) Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS BO); United States Fish and Wildlife Service (USFWS) Biological Opinion on the Long-Term Operations of CVP and SWP (USFWS BO) (delta smelt); and, the update to the 2006 *Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan), Phase II.

Project: Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) and Central Valley-Wide Salt and Nitrate Management Plan (SNMP)

Status: Future—project development is ongoing

Location: Central Valley

Project description: This project would address salinity and nitrate problems in the Central Valley and develop long-term solutions that would lead to enhanced water quality and economic sustainability. In 2006, the State Water Board and Central Valley Regional Water Quality Control Board (Central Valley Water Board) initiated this stakeholder effort. Near-term projects include developing the first phase of a conceptual model for salt and nitrate conditions in the Central Valley and a comprehensive and robust geographic information systems (GIS) framework to support the salt management planning effort. The overarching goals of CV-SALTS include protecting and enhancing the environment and maintaining reliable, high-quality urban water supply, while also retaining the agricultural economy and supporting economic growth. The specific goal is to develop a salt-management plan in compliance with the state's recycled water policy. The Central Valley Water Board held a series of California Environmental Quality Act (CEQA) scoping meetings in October, 2013 for the development of an SNMP for incorporation into the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Sacramento–San Joaquin Basin Plan) and the Water Quality Control Plan for the Tulare Lake Basin (Tulare Lake Basin Plan). Additional stakeholder meetings regarding the development of the SNMP and possible amendments to the Sacramento–San Joaquin Basin Plan and Tulare Lake Basin Plan were held in June and August, 2016. The draft SNMP is expected to be completed in late 2016. This project also includes the development of new water quality objectives for salinity for the lower San Joaquin River (LSJR) upstream of Vernalis, which will be proposed as a future basin plan amendment to the Sacramento–San Joaquin River Basin Plan.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Service providers

CV-SALTS would balance the use of assimilative capacity and the implementation of management measures. Therefore, it could change the timing and magnitude of salt discharges to the LSJR and southern Delta channels, which could affect water quality conditions in the LSJR, including salt loading. Thus, CV-SALTS could have a related effects as the plan amendments on surface hydrology and water quality and service providers.

Project: County General Plan Updates

Status: Ongoing

Location: Merced, San Joaquin, and Stanislaus Counties

Project description: General plans for counties identify land use designations, land use changes, and plans for growth. Following is a list of plans and the status of updates for the counties that can cause similar impacts as the plan amendments.

Merced—The 2030 *Merced County General Plan* was adopted on December 10, 2013. The plan is an overarching policy document that guides land use, housing, transportation, infrastructure, community design, and other policy decisions.

- San Joaquin—The draft 2035 *General Plan for San Joaquin County* was released for public comment in October, 2014. Many of the existing policies of the county's 2010 General Plan remain unchanged, but the comprehensive update reflects a new vision for future growth and development within the county. It also reflects recent state law requirements, including: Delta protection and use; flood risk protection; water and energy conservation; and GHG emissions reductions.
- Stanislaus—Revises the Land Use, Circulation, Conservation/Open Space, Noise, and Safety Elements. The update will incorporate changes in legislation, code, and local standards on a 20-year planning horizon (to 2035). There will be no changes to the Land Use map designations. The draft EIR was released for public review in April 2016.

Resource areas with potential cumulative effects:

- Agricultural resources
- Groundwater resources
- Service providers

The San Joaquin Valley is one of the fastest-growing areas in California, with urban expansion often resulting in the conversion of land from agricultural uses to nonagricultural uses. Although county general plans regulate land use conversions (e.g., Stanislaus County requires a majority of county voters to approve rezoning land designated as agricultural or open space to residential), urban expansion efforts that prioritize the implementation of water supply projects and other construction, could result in the removal of land from agricultural use in the plan area, including Important Farmland. The final EIR for the Merced 2030 General Plan and the draft EIR for the Stanislaus General Plan Update state that buildout under the plans could result in significant impacts related to groundwater depletion and recharge. The draft EIRs for the San Joaquin 2035 General Plan and the Stanislaus General Plan Update state that there would be significant impacts related to the construction of new water supply or treatment facilities or the expansion of existing facilities. Thus, these county general plans could have related an effects as the plan amendments on agricultural resources, groundwater resources, and service providers.

Project: Delta Stewardship Council (DSC) Delta Plan

Status: Future

Location: Delta

Project description: The Delta Plan addresses a range of challenges facing the Delta, including water supply reliability and Delta ecosystem health concerns. The Sacramento–San Joaquin Delta Reform Act of 2009 (California Water [Cal. Wat.] Code, § 85000 et seq.) provides for the establishment of an independent state agency, the DSC, to achieve the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem. The DSC is charged with the development and implementation of a legally enforceable, long-term comprehensive management plan for the Sacramento–San Joaquin Delta to achieve the coequal goals. The Delta Plan was unanimously adopted by the DSC on May 16, 2013 and became effective on September 1, 2013. On June 23, 2016, a Sacramento Superior Court judge issued a ruling setting aside the Delta Plan because parts of it were not consistent with the Delta Reform Act and ordering the DSC to revise the Delta Plan. The decision has been appealed. Any revised Delta Plan would likely be similar to the existing plan because many aspects of the plan were upheld and are required to fulfill the statutory mandates of the Act.

The Delta Plan is intended to provide a comprehensive, long-term management plan for the Delta, and it establishes regulatory policies that would be binding on certain covered actions (as defined in Cal. Wat. Code § 85057.5) and non-binding recommendations to further the state's coequal goals for the Delta. DSC does not exercise direct review and approval over covered actions. Covered actions are plans, programs, or projects that (1) will occur, in whole or in part, within the boundaries of the Delta or Suisun Marsh; (2) will be carried out, approved, or funded by the state or a local public agency; and (3) is covered by one or more of the Delta Plan policy areas (reliable water supply; delta ecosystem restoration; water quality improvement; flood risk reduction; and, protection and enhancement of the Delta as an evolving place).

The Delta Plan will be implemented through requiring the statutorily defined covered actions of other public agencies to be consistent with the Delta Plan and providing recommendations to other public agencies regarding future actions they may take. While the State Water Board's regulatory actions are not covered actions subject to the Delta Plan, the Delta Plan contains recommendations for State Water Board's development of flow objectives and criteria for the Delta and major tributary streams in the Delta watershed. The State Water Board identified the Stanislaus, Tuolumne, and Merced Rivers as high priority tributaries for these actions. While the Delta Plan could result in other agencies or entities taking future actions, it would not directly result in regulatory approvals or actions, or other projects. The EIR for the Delta Plan explains that it evaluates potential actions as part of its proposed project, even though the Delta Plan would not directly cause, and the DSC would not have regulatory authority over, most actions (Delta Stewardship Council 2013).

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Flooding, sediment, and erosion
- Agricultural resources
- Energy and greenhouse gases

While the Delta Plan would not directly result in regulatory approvals, actions, or other projects, it could result in other agencies or entities taking future actions. The Delta Plan could recommend and require consistency determinations for projects that could affect circulations patterns in the southern Delta. These projects could reduce circulation of water in the southern Delta, which could reduce dilution of locally saline water and increase salinity in the southern Delta channels. This could increase the number of months with EC above the water quality objective for salinity at the southern Delta compliance locations, thereby potentially affecting the surface hydrology and water quality resources. Additionally, if the Delta Plan recommends projects that involve habitat restoration or flow augmentation, it could have a cumulative effect on flooding, sediment, and erosion. Or, if the Delta Plan recommends projects that could convert agricultural land to nonagricultural uses (e.g., habitat restoration), it could have a cumulative effect

on agricultural resources. Lastly, construction of projects recommended by the Delta Plan could rely on considerable use of heavy equipment and construction vehicle trips, which could lead to increased GHG emissions and could have an effect on energy and greenhouse gases.

Project: **Federal Energy Regulatory Commission (FERC) Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)**

Status: Future—project development is ongoing

Location: Tuolumne County, Tuolumne River

Project description: This project would relicense the Don Pedro Hydroelectric Project so it can continue to operate under new license conditions. The current FERC license expired on April 30, 2016. Modesto and Turlock Irrigation Districts filed their application for a new license on April 28, 2014. FERC relicensing of the New Don Pedro Project may affect the operations of the CCSF's Hetch Hetchy system if CCSF contributes water supply to meet instream flows imposed as a condition of water quality certification associated with the relicensing or otherwise imposed through the relicensing process. Currently, however, there is no specific action to alter Hetch Hetchy operations. Some studies remain to be completed before agencies and other stakeholders can file recommended terms and conditions with FERC. State Water Board staff are engaged in the FERC process and will provide input at the appropriate time regarding new streamflow recommendations and other measures for the projection of beneficial uses in the Tuolumne River. The State Water Board also has mandatory conditioning authority due to the required water quality certification under Clean Water Act (CWA) Section 401.

Resource areas with potential cumulative effects:

- Flooding, sediment, and erosion
- Aquatic biological resources
- Terrestrial biological resources
- Recreation resources and aesthetics
- Agricultural resources
- Cultural resources
- Energy and greenhouse gases

The operation of this project was considered in the effects analysis for the LSJR alternatives, including a wide range of potential flow releases. As such, the cumulative effects for the resources listed above are not expected to be significantly different from those identified for the LSJR and SDWQ alternatives, as discussed in the respective resource chapters (Chapters 5–14). However, localized changes resulting principally from re-operation of the reservoir could occur as other agencies have mandatory conditioning authority and because there could be project-specific operational and infrastructure changes. While there are currently no specific action to alter Hetch Hetchy operations any change in CCSF's operations could result in potential cumulative effects to the resources listed above. Localized changes at Don Pedro Reservoir or upstream within the CCSF systems could have a related effects as the plan amendments on the resource areas listed above.

Project: **FERC Relicensing of Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)**

Status: Future—project development is ongoing

Location: Mariposa County, Merced River

Project description: This project would relicense the Merced River and Merced Falls hydroelectric projects (owned by Merced Irrigation District [ID] and Pacific Gas and Electric Company [PG&E], respectively) so they can continue to operate under new license conditions. The original licenses for both projects expired on February 28, 2014. However, both projects continue to operate under FERC-issued annual licenses, which include the conditions of the original licenses, until the relicensing proceedings are completed and new licenses are issued. The participants in the FERC relicensing process filed recommended terms and conditions for inclusion in a new FERC license, and FERC issued a draft EIS for the relicensing of the Merced River Project and the Merced Falls Project on March 30, 2015. Comments on the draft EIS were due to FERC on May 29, 2015 and FERC will address those comments in a final EIS. Merced ID has begun the process to purchase the Merced Falls Hydroelectric Project from PG&E, and so will be the licensee for both projects.

Resource areas with potential cumulative effects:

- Flooding, sediment, and erosion
- Aquatic biological resources
- Terrestrial biological resources
- Recreation resources and aesthetics
- Agricultural resources
- Cultural resources
- Energy and greenhouse gases

The operation of this project was considered in the effects analysis for the LSJR alternatives, including a wide range of potential flow releases. As such, the cumulative effects for the resources listed above are not expected to be significantly different from those identified for the LSJR and SDWQ alternatives, as discussed in the respective resource chapters (Chapters 5–14). However, localized changes resulting principally from re-operation of the reservoir could occur as other agencies have mandatory conditioning authority and because there could be project-specific operational and infrastructure changes. These localized changes could have related effects as the plan amendments on the resource areas listed above.

Project: **FERC Relicensing of Lyons Reservoir**

Status: Planned/ongoing

Location: Upper Stanislaus River (south fork)

Project description: This project would relicense the Lyons Reservoir Hydroelectric Project and allow PG&E continued operation under the facility under new license conditions. The current FERC license expires in August of 2022. PG&E will begin the FERC relicensing process around August of 2017 with their final license application due in the summer of 2020. Studies of the reservoir and system (including the transfer of water to Tuolumne Utilities District (TUD) via the Main Tuolumne Canal to a penstock that connects to PG&E's Phoenix Powerhouse; between 4 to 30 cfs is regularly passed through the powerhouse and discharged to Power Creek) remain to be completed before agencies and other stakeholders can file recommended terms and conditions with FERC. State Water Board staff will be engaged in the FERC process and will provide input at the appropriate time regarding new streamflow recommendations and other measures for the projection of beneficial uses in the Stanislaus River. The State Water Board also has mandatory conditioning authority due to the required water quality certification under CWA Section 401.

Resource areas with potential cumulative effects:

- Aquatic biological resources
- Terrestrial biological resources

- Cultural resources
- Recreation resources and aesthetics
- Cultural resources
- Hydropower
- Energy and greenhouse gases

Localized changes resulting principally from re-operation of the reservoir could occur as other agencies have mandatory conditioning authority and because there could be project-specific operational and infrastructure changes. Localized changes at Lyons Reservoir could have related effects as the plan amendments on the resource areas listed above.

Project: Groundwater recharge projects

Status: Ongoing

Location: Eastern San Joaquin, Modesto, Turlock, and Merced Groundwater Subbasins

Project description: These projects are intended to replenish groundwater resources to prevent or minimize groundwater overdraft and subsidence issues, and are used as part of a conjunctive management approach to ensure a reliable, drought-tolerant regional water supply by banking water in wet years for use in dry years. An example of a groundwater recharge project is the Farmington Groundwater Recharge Program in San Joaquin County. The Stockton East Water District (SEWD), United States Army Corps of Engineers, and other local water agencies launches the project to partner with local landowners, businesses, growers, and ranchers to save the region's water supply by recharging an average of 35 thousand acre-feet (TAF) of water annually into the Eastern San Joaquin Subbasin, in the eastern part of San Joaquin County. The goal of the program is to directly recharge the groundwater basin and increase surface water deliveries in-lieu of groundwater pumping to reduce overdraft and establish a barrier to saline water intrusion.

Resource areas with potential cumulative effect:

- Surface hydrology and water quality
- Aquatic biological resources
- Agricultural resources

Water diverted from the Stanislaus, Tuolumne, and Merced Rivers and the SJR upstream of Merced for these projects could result in decreased inflow of low salinity water into the southern Delta, possibly resulting in higher concentration of pollutants in the SJR and increased salinity in the southern Delta. These projects could also reduce the quality and quantity of water that remains in the rivers and is available for agriculture irrigation, and therefore could have related effects as the plan amendments on surface hydrology and water quality, aquatic biological resources, and agricultural resources. However, as discussed in Chapter 7, *Aquatic Biological Resources*, stream flows are expected to remain within the historic range.

Project: Habitat restoration projects

Status: Planned/ongoing

Location: Merced, Stanislaus, and Tuolumne Watersheds

Project description: Habitat restoration projects may address aquatic habitat (e.g., the Habitat Restoration Plan for the Lower Tuolumne River Corridor and the Gravel Mining Reach Floodway Restoration Projects), or terrestrial habitat (e.g., the Grayson River Ranch Conservation Easement). Restoration projects may include (1) physical activities to address gravel-dominated reaches of the tributaries, where past in-channel and channel-adjacent gravel mining have simplified the channel configuration and aquatic habitat and reduced gravel transport; or (2) re-establishing native plant species and restoring floodplains. Projects considered are as follows.

- Central Valley Project Improvement Act—Mandate to balance competing demands for a limited supply of water, which include: meeting the requirements of fish and wildlife protection, restoration and enhancement; agriculture; and municipal, industrial, and power uses. The 1992 legislation includes mandates that change the management of the CVP and measures that are likely to reduce the amount of water available for irrigation and municipal use. Continued implementation actions include habitat restoration actions in the plan area.
- California EcoRestore (A California Natural Resources Agency initiative)—Help coordinate and advance habitat restoration in the Sacramento–San Joaquin Delta. A broad range of habitat restoration projects will be pursued, including projects to address aquatic, sub-tidal, tidal, riparian, floodplain, and upland ecosystem needs.
- Dos Rios Ranch—Restore land to provide wildlife habitat and flood control in Central Valley on 1,600 acres of biologically rich floodplain in the Central Valley, including along the SJR and Tuolumne River.
- Gravel Mining Reach Floodway Restoration—Restore 7 miles of Tuolumne River actively gravel mined area to increase floodway capacity to convey 15,000 cfs, increase salmon spawning and rearing habitat, protect dikes and off-channel pits from future flood damage, and restore riparian forests on floodplains.
- Habitat Restoration Plan for the Lower Tuolumne River Corridor—Provide an integrated and long-term restoration strategy for the Lower Tuolumne River to maximize anadromous fish habitat improvements, minimize channel restoration project costs, and streamline project evaluation and monitoring. The plan's development process is intended to (1) propose general types of inventoried preservation and restoration sites, (2) evaluate fluvial geomorphic processes, (3) evaluate geomorphic-salmonid relationships and develop restoration strategy, (4) finalize restoration site list and designs, and (5) integrate into a comprehensive river corridor habitat restoration plan.

  Knights Ferry Floodplain and Side-Channel Restoration—Restore existing side-channel and floodplain habitat to benefit Chinook salmon and steelhead.
- Lower Tuolumne River Big Bend Project—Improve forest, river, and wildlife habitats along the Tuolumne River. When completed, over 25,000 native trees and shrubs will have been planted, and over 150 acres of native grasses and forbs will have been seeded throughout the 240,250-acre project area.
- Restoration of the Ruddy Mining Reach—Restore and increase salmonid spawning and rearing habitat along the lower Tuolumne River in the Ruddy Mining area. The project covers a 6.1-mile length of channel and is located approximately 23 miles east of Modesto.
- Proposed Expansion of the San Joaquin River National Wildlife Refuge—Expand the refuge and acquire up to 22,156 acres along the LSJR and Tuolumne and Stanislaus Rivers to protect and restore riparian habitat to benefit the birds of the Pacific Flyway and numerous other wildlife species.

- Spawning Gravel Supplementation (Stanislaus County, Tuolumne River)—Mechanically place large volumes of gravel followed by periodic augmentation and maintenance of gravel supply, as needed, for river restoration.
- Tuolumne River Restoration Projects including Warner Deardorff Segment, Mining Reach Project No. 3—Return a 6.1-mile reach of the Tuolumne River to a more natural, dynamic channel morphology to improve, restore, and protect instream and riparian habitat for fall-run Chinook salmon survival, including restoring hydrological and geomorphic processes.

Resource areas with potential cumulative effects:

- Flooding, sediment, and erosion
- Terrestrial biological resources
- Agricultural resources

Habitat restoration projects are typically not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential. However, if the projects involve construction in or adjacent to channels, the projects may alter the course of a stream or river such that substantial erosion or siltation on- or offsite may result. Additionally, habitat restoration projects typically not expected to result in an impact on terrestrial biological resources as they are meant to recover wildlife species and habitat. However, projects may have short-term impacts (e.g., construction noise or temporary removal of habitat) on sensitive terrestrial species and habitat. Habitat restoration projects could reduce water availability from the Stanislaus, Tuolumne, and Merced Rivers and the SJR, which could reduce the number of irrigated acres, thereby potentially resulting in related effects as the plan amendments on agricultural resources.

Project: Merced County's Castle Airport Master Plan (AMP) for Development of Castle Airport

Status: Future—project development is ongoing

Location: Merced County

Project description: Adopted by Merced County in 2011, the AMP lays out the plan for ultimate development of the airport and its operations. The project would convert the former U.S. Air Force base into a civilian use airport that would include an air cargo facility, a corporate and private aircraft service center, a charger operation, modern hangers, and a cold storage facility for produce. The AMP functions as a tool for the implementation of the aviation elements, and is consistent with the planned airport facilities and operations are specified in the 1996 Castle Air Force Base Reuse Plan. The completed project would include office and commercial development, and is expected to promote new jobs to area residents, air cargo and airline operations, stimulate investment and new growth, and create employment opportunities and commercial development. The project's initial study found that this project would result in increased water demand and is likely to deplete groundwater supplies (County of Merced Department of Commerce 2011).

Resource areas with potential cumulative effects:

- Groundwater resources
- Service providers
- Energy and greenhouse gases

This project is expected to encourage population growth, which could increase water use in the region, which has historically relied on groundwater supplies. Increased water demand could increase groundwater pumping, thereby affecting groundwater resources and the service providers who would need to meet the increased water demand. Additionally, this project could have construction-related impacts that could lead to increased GHG emissions. Thus, the project could have related effects as the plan amendments on groundwater, service providers, and energy and greenhouse gases.

Project: Modesto Regional Water Treatment Plant (MRWTP) Phase Two Expansion Project

Status: Ongoing

Location: Tuolumne River and SJR Watersheds in Stanislaus County

Project description: The Modesto Irrigation District (MID) and the City of Modesto expansion of the City's water treatment plant doubles the plant's capacity. The project also involves the construction of multiple downstream facilities (including storage reservoirs, pump stations, transmission and distribution pipelines, and regulating values) to provide adequate municipal and industrial water supply within the City's service area. The project is intended to ensure reliable water supplies, and meet increased water demands associated with projected population growth in the region. Lastly, the project's Final Subsequent Environmental Impact Report states that the City of Modesto is also building additional water supply wells to make up for well capacity that has been lost due to contamination (MID 2005).

Resource areas with potential cumulative effects:

- Groundwater resources
- Agricultural resources
- Energy and greenhouse gases

This project would improve the quality of drinking water sources and therefore would not result in cumulatively considerable or significant effects on service providers. This project is partially in response to projected population growth and the associated increases in total water use demands. As this area has historically relied on groundwater supplies, increased water demand could increase groundwater pumping, thereby affecting groundwater resources. Increasing the plant's capacity allows the City to receive more water for domestic use, which could result in reduced water availability for agricultural uses, thereby reducing the number of acres that could be irrigated. Additionally, this project could have construction-related impacts that could lead to increased GHG emissions. Thus, the project could have related effects as the plan amendments on groundwater, agricultural resources, and energy and greenhouse gases.

Project: NMFS Biological Opinion and Conference Opinion on the Long-Term Operations of the CVP and SWP

Status: Present

Location: SJR, tributaries, southern Delta, Delta

Project description: A 2009 BO in which NMFS concluded that continued operations of the CVP and SWP would likely jeopardize several listed species, including Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, the southern distinct population segment of North American green sturgeon, and southern resident killer whales. The 2009 BO identifies the following actions to be taken by USBR and/or DWR.

- Limit the magnitude of reverse flows in Old and New Rivers to reduce entrainment of juvenile fish into state and federal export facilities in the southern Delta.
- Implement facility improvements at state and federal export facilities to increase fish survival.
- Implement measures, including a fish study using acoustic tags, to increase survival of juvenile steelhead migrating from the SJR Basin.
- Implement a year-round minimum flow regime that improves conditions for steelhead in the Stanislaus River.
- Issue a BO effective through December 31, 2030.
- Propose a reasonable and prudent alternative (RPA) that, if implemented, is believed to avoid the likelihood of jeopardizing the continued existence of these listed species.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Aquatic biological resources
- Terrestrial biological resources
- Agricultural resources
- Cultural resources
- Energy and greenhouse gases

This project places limits on SWP and CVP exports and reverse flows on Old and Middle Rivers. These changes to hydrodynamics in the Delta, including limits on Old and Middle River flows, could affect circulation patterns in the southern Delta and could result in different salinity conditions in the southern Delta. Through elevated salinity levels in the southern Delta, the ongoing project, therefore, has the potential to have a cumulative effect on surface hydrology and water quality, aquatic biological resources, terrestrial biological resources, and agricultural resources. Additionally, this project could result in the re-operation of the reservoirs which could lead to a change in the amount and timing of water surface elevation fluctuations in the reservoirs. A change in the rates of flows downstream of the reservoirs could have a cumulative effect on the cultural resources. These changes could also change the timing of, or reduce, hydropower generation from the dams, which, in turn, could have an effect on energy resources.

Project: Recreation management and improvement projects

Status: Planned/ongoing

Location: Merced, Stanislaus, and Tuolumne Watersheds, and SJR up to Friant Dam

Project description: These long-term management plans implement projects to improve and increase recreation facilities and establish a visitor use capacity program that addresses the kinds and amounts of public use that can be sustained while protecting and enhancing the resource. Projects considered include the following.

- Tuolumne Wild and Scenic River Comprehensive Management Plan—Long-term management plan for the 54-mile stretch of the Tuolumne Wild and Scenic River corridor within Yosemite National Park to ensure a high-quality visitor experience. The plan includes projects that would expand recreational opportunities in the riparian zone and improve conditions that pose localized risks to scenic vistas. Located within the extended plan area.
- Merced Wild and Scenic River Final Comprehensive Management Plan—Long-term management plan for the Merced River corridor to ensure a high-quality visitor experience. The plan includes projects that would increase camping opportunities, diversity recreation options, and restore the riverbank, which would improve in-water recreation activities. Located within the extended plan area.
- Central Valley Vision—A 20-year roadmap for improving state parks in the Central Valley. Includes improving and increasing recreation facilities at existing parks (e.g., new boating trails, increasing the number of campsites and picnic sites, and improving river access for swimming, boating, and other water sports) along the Stanislaus, Merced, and Tuolumne Rivers and the SJR.
- San Joaquin River Blueway Plan—A plan that provides the public opportunities to explore and enjoy the SJR from its headwaters to the Delta via a network of parks, wildlife refuges, and other publicly accessible places. The long-term vision plan, released in 2011, proposes improved access to the Upper SJR by creating a blueway—a boating trail to camping, fishing, bird watching, and other kinds of recreation. The plan would provide additional shore-based recreation opportunities, which may result in increased opportunities for water-enhanced recreation. The plan would expand recreational opportunities and use of the SJR without degrading the condition or visual character of the resource.

Resource areas with potential cumulative effects:

- Recreation resources and aesthetics

These types of projects are typically not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential. And, unrelated to flow and water levels, these and similar projects would be expected to modify and enhance on-bank and in-water recreational opportunities. However, the development of recreation facilities around the reservoirs and urbanization of the watersheds could impact the views and viewsheds (i.e., aesthetics) experienced by recreationists. Thus, the projects could have related effects as the plan amendments on recreation resources and aesthetics.

Project: San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy Repair and Rehabilitation Program and Lower Cherry Aqueduct Emergency Rehabilitation

Status: Present

Location: Tuolumne River and Lower Cherry Aqueduct

Project description: The Lower Cherry Aqueduct (LCA) consists of a small diversion dam on Cherry Creek and a 3.6-mile-long aqueduct comprised of alternating segments of tunnel, canal, and above-ground and buried pipelines that convey water from Cherry Creek Diversion Dam (CCDD) to Early Intake Reservoir on the Tuolumne River. At Early Intake Reservoir, Mountain Tunnel head gates can be opened to allow water to flow into the SFPUC's tunnel and pipeline system that carries water to the San Francisco Bay Area. The reliable function of this facility is critical for providing a backup water supply for SFPUC customers. The proposed improvements, to be implemented in two phases, would initially replace open canal sections with large-diameter buried pipe; restore and replace deteriorated fire-damage structures at CCDD, and restore the access path to the CCDD. In the future, one section of elevated pipeline that constricts the flow of the aqueduct would be replaced with a larger-diameter pipeline to restore the facility's historical design capacity of 200 cfs.

Resource areas with potential cumulative effects:

- Aquatic biological resources
- Terrestrial biological resources

Streamflows within Eleanor and Cherry Creeks would be directly affected by operation of LCA. Operation of the LCA also would have an indirect streamflow effect within Cherry Creek downstream of Holm Powerhouse and on the mainstem of the Tuolumne River during reservoir storage recovery years. As such, implementation could have an effect on habitat conditions for aquatic and biological species.

Project: Sustainable Groundwater Management Act (SGMA)

Status: Present

Location: Groundwater basins underlying the LSJR, Delta, and tributaries

Project description: SGMA establishes a framework requiring local agencies to sustainably manage groundwater resources. SGMA imposes deadlines for local agencies to form groundwater sustainability agencies, draft groundwater sustainability plans, and implement those plans to achieve groundwater sustainability within 20 years of plan adoption. SGMA authorizes state intervention in groundwater basin management if local managers are unable or unwilling to meet SGMA requirements. Given the directive to local agencies, and the backstop of state intervention if needed, it is anticipated that SGMA, along with other groundwater recharge, conjunctive use, and management projects, would not adversely impact groundwater resources and would actually benefit groundwater resources.

Resource areas with potential cumulative effects:

- Agricultural resources

SGMA would improve groundwater resources and provide service providers tools to prevent and/or mitigate domestic well drinking water supply impacts and therefore are not expected to result in a

cumulative impact on groundwater resources and service providers. However, the initial implementation of SGMA could result in limits on groundwater supply for agricultural uses during the transition from current practices to sustainable groundwater management and, thus, could affect agricultural resources. Therefore, implementation of SGMA could potentially have a cumulative effect on agricultural resources.

Project: Tuolumne Utilities District (TUD) Phoenix Lake Preservation and Restoration Project

Status: Present and Future, -On-going Phased Project

Location: Tuolumne River, Tuolumne County

Project description: Phoenix Lake is an 88-acre water storage reservoir located approximately 3 miles east of the City of Sonora. Phoenix Lake water rights and facilities, as well as portions of the lake, are owned by the TUD. The TUD uses the lake as a primary drinking water source for the communities of Sonora, Jamestown, Scenic View and Mono Village. While the allowable storage capacity of the lake is approximately 900 acre-feet (AF), the current capacity is only 600 AF.

Phase III project will improve the water quality and restore storage capacity in Phoenix Lake and the Phoenix Lake watershed. Phase III will provide access to approximately 170 AF of water that currently does not exist. The construction of the sediment forebay will remove a majority of the sediments transported to the lake via the Sullivan Creek watershed.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Aquatic biological resources
- Terrestrial biological resources
- Recreational resources and aesthetics
- Cultural resources
- Energy and greenhouse gases

Depending on the historical diversions of TUD, the diversions could increase by up to 170 AF, given that Phase III would increase storage capacity up to that amount. This diversion could occur during the summer when water is typically used by TUD. As such, the on-going project also has the potential to have a cumulative effect on aquatic biological resources in the reservoir, terrestrial biological resources around the reservoir, and recreational resources and aesthetics in and around the reservoir depending on the drawdown experienced by the reservoir under the new storage capacity. The project is intended to improve water quality conditions in the lake and the long term health of the lake and its storage capacity, and as such is expected to have a beneficial effect on surface hydrology and water quality.

Project: USFWS Biological Opinion on the Long-Term Operations of CVP and SWP (delta smelt)

Status: Present

Location: SJR, tributaries, southern Delta, Delta

Project description: USFWS issued an opinion on December 15, 2008, to USBR on the effects of the continued operation of CVP and SWP on delta smelt and its designated critical habitat. It identified an RPA intended to protect each life stage and the critical habitat of the federally protected delta smelt and its designated critical habitat that includes flow components.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Aquatic biological resources
- Agricultural resources

This project places limits on SWP and CVP exports and reverse flows on Old and Middle Rivers. The NMSF

biological opinion is meant to protect fish listed under ESA from being jeopardized by the adverse effects of SWP and CVP export water operations. While the required reservoir releases and pumping reductions could reduce direct impacts on fish, thereby not resulting in an impact on aquatic biological resources, less Sacramento River water could be drawn into the southern Delta, which could increase salinity. These changes to hydrodynamics in the Delta, including limits on Old and Middle River flows, could affect circulation patterns in the southern Delta resulting in different salinity conditions in the southern Delta. Through elevated salinity levels in the southern Delta, the on-going project also has the potential to have a cumulative effect the surface hydrology and water quality, and agricultural resources.

Project: University of California (UC) Merced 2020 Project

Status: Future—project development is ongoing

Location: Merced County

Project description: The project will double the size of the UC Merced campus to accommodate up to 10,000 students by 2020. The project would add approximately 1.2 million gross square feet of classroom, laboratory, student life, housing, and administrative and faculty space on 219 acres, including 136 acres of undeveloped land adjacent to the existing campus.

Resource areas with potential cumulative effects:

- Groundwater resources
- Service providers
- Energy and greenhouse gases

This project is expected to encourage population growth, which could increase water use in the region, which has historically relied on groundwater supplies. Therefore, it can be presumed increased water demand could increase groundwater pumping, thereby affecting groundwater resources and the service providers who would need to meet the increased water demand. Additionally, although the completed project is expected to reduce GHG emissions, the construction of the project would rely on considerable use of heavy equipment and construction vehicle trips, which could lead to increased GHG emissions. Thus, the project could have related effects as the plan amendments on groundwater, service providers, and energy and greenhouse gases.

Project: Update to the 2006 Bay-Delta Plan, Phase II

Status: Future—project development is ongoing

Location: Delta

Project Description: The comprehensive update of the 2006 *Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan) by the State Water Board will evaluate and potentially amending existing water quality objectives that protect beneficial uses and the program of implementation to achieve those objectives. The elements of the Phase II update are: (1) Delta outflow objectives, (2) export/inflow objectives, (3) Delta Cross Channel Gate closure objectives, (4) Suisun Marsh objectives, (5) potential new reverse flow objectives for Old and Middle Rivers, (6) potential new floodplain habitat flow objectives, (7) potential changes to the monitoring and special studies program, and (8) other potential changes to the program of implementation. The State Water Board will also consider other potential changes to the Bay-Delta Plan during Phase II, including issues identified through the scoping process and information that is produced as part of California WaterFix.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Aquatic biological resources

- Agricultural resources
- Service providers

The principal elements of the Phase II update that could have potential cumulative effects are changes in export/inflow objectives and reverse flow objectives for Old and Middle River. The export/inflow objectives could change the timing and magnitude of exports from SWP and CVP pumping facilities, and other diversions, in the southern Delta in order to protect migrating salmon and other species. New reverse flow objectives for Old and Middle River could affect the quantity and timing of high quality Sacramento River flows across the Delta from the Sacramento River to the SWP and CVP export facilities in the southern Delta. Both of these elements have the potential to change salinity conditions, including elevated salinity, in the southern Delta, which could have a cumulative effect on surface hydrology and water quality. Elevated salinity in the southern Delta channels would reduce assimilative capacity in southern Delta channels, and that could have an effect on aquatic biological resources, agricultural resources, and service providers.

Project: Upper San Joaquin River Restoration Program (SJRRP), including Water Year 2010 Interim Flows Project

Status: Present

Location: Fresno and Madera Counties, Upper SJR

Project description: This program is a comprehensive long-term effort to restore flows to the SJR from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The first water releases from Friant Dam in support of the SJRRP, called interim flows, began October 1, 2009. Restoration flows began January 1, 2014. The program includes provisions to reduce or avoid water supply impacts by recapturing water. This element of the program may include modifications to existing facilities or the construction of new facilities to deliver water directly back to the Friant Division Contractors, or may be made available to others through transfers, exchanges or sales. This may include operational changes and the construction of facilities in the LSJR and the Delta.

Resource areas with potential cumulative effects:

- Flooding, erosion, and sediment
- Aquatic biological resources

This project will increase flows in the SJR upstream of the plan area, and so it has the potential to improve conditions for fish and increase groundwater recharge in the southeastern boundary of the plan area. To the extent that any of the flows continue downstream of the Merced River confluence, the project has the potential to increase LSJR flows, thus benefitting fish and wildlife. Most of the potential effects of the project occur in areas that have not recently had any flow in most years. These areas are in the LSJR upstream of the Merced River confluence and are outside of the plan area. While there is potential for the project to result in flooding and seepage effects in the SJR and have effects on terrestrial, recreational, and agricultural resources, these effects would occur outside the plan area. To the extent that the Upper SJRRP flows contribute to increased flows in the LSJR at and below the Merced River confluence, the project could increase the movement of contaminants into the LSJR and affect temperatures. Thus, there is a potential for a cumulative significant effect on aquatic biological resources.

Environmental documents prepared for the project identify that there could be increases of temperature in the SJR downstream of the Merced River, but these are at times of very low Merced River flows. The LSJR alternatives would increase Merced River flows overall, thus reducing any such temperature effect. The Upper SJRRP environmental documents conclude that surface water effects in the SJR from the Merced River to the Delta would be less than significant and that there would be a less-than-significant effect on fall-run Chinook salmon and other native fishes in the Stanislaus, Tuolumne, and Merced Rivers. The

adaptive implementation element of the LSJR alternatives allows the timing of flows to be optimized to achieve the flow objectives while allowing for consideration of other beneficial uses, thus further reducing or eliminating any possible temperature effect.

Project: Water transfers

Status: Future

Location: Sacramento River and SJR Watersheds

Project description: Water transfers are likely to occur in the future and may involve transfers of water between entities within the project area, transfers from outside the project area to users within the project area, or transfers from entities within the project area to users outside the project area. Water transfers would occur beyond those that would occur in response the LSJR alternatives. Water transfers that involve changes in point of diversion, place of use, or purpose of use to a post-1914 water right most often require the approval of the State Water Board. Transfers of water between CVP contractors or SWP contractors do not require action by the State Water Board unless the point of diversion, purpose of use, or place of use under the CVP's or SWP's water right needs to be changed to accomplish the transfer. Transfers that require the use of state, regional, or a local public agency's conveyance facilities require the owner of the conveyance facilities (e.g., DWR, USBR) to determine that the transfers will not harm any other legal user of water, will not unreasonably affect fish and wildlife, and will not unreasonably affect the overall economy of the county from which the water is transferred. The most common forms of water transfers involve reservoir reoperation, substitution of groundwater for surface water, and crop acreage idling.

Resource areas with potential cumulative effects:

- Surface hydrology and water quality
- Flooding, sediment, and erosion
- Aquatic biological resources
- Terrestrial biological resources
- Groundwater resources
- Recreational resources and aesthetics
- Agricultural resources
- Energy and Greenhouse Gases

Water transfers have the potential to change or increase flows, which could alter the hydrodynamics in the southern Delta, and could have a cumulative effect on surface hydrology and water quality. Because any increases in flows resulting from the transfers would be well within normal channel capacities, water transfers are typically not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential. However, transfers that include a flow shifting component could reduce flows outside the transfer period and could result in reduced surface water availability, both of which could have a cumulative effect on aquatic biological resources; terrestrial biological resources; groundwater resources; and agricultural resources. Energy and greenhouse gases could also be affected if reservoir releases are substantially changed such that hydropower is not produced when it may be needed. Lastly, transfers could alter reservoir levels, which could have an impact on recreational resources and aesthetics. As such, transfers could have an effect on the resource areas listed above.

Projects with No Potential Cumulative Impacts

In considering other projects that may contribute to related impacts in combination with the LSJR and SDWQ alternatives, this SED identified categories of projects that may have beneficial impacts on environmental resources, or would otherwise not have related adverse effects and are, therefore, not expected to contribute to significant cumulative impacts. This section identifies such categories of projects.

Projects with Beneficial Effects

Some projects will generally improve water quality conditions, and have a beneficial effect on surface hydrology and water quality in the plan area. As such, these projects are not expected to contribute to significant adverse effects in the plan area or extended plan area. Examples of such projects include the following.

- Agricultural Drainage Selenium Management Program—Reduce agricultural drainage containing elevated levels of selenium (through land and irrigation management practices) and limit where and when drainage water can be discharged.
- Conditional Waiver of Waste Discharge Requirements for Irrigated Lands—Central Valley Regional Water Quality Control Board (Central Valley Water Board) will use conditional waivers to develop new and additional information to establish a more reasonable basis for adoption of individual or general waste discharge requirements in the future. A conditional waiver is a regulatory process under California's nonpoint source program designed to meet requirements of the California Water Code. Discharges from irrigated agricultural lands are regulated to prevent the agricultural discharges from impairing the waters that receive the discharges.
- Grasslands Bypass Project (U.S. Bureau of Reclamation [USBR] and San Luis Delta Mendota Water Authority discharges of salt, selenium, and boron)—This project in Merced and Fresno Counties prevents discharge of subsurface agricultural drainage water into wildlife refuges and wetlands in central California and reduces the discharge of selenium, boron, and salt into the SJR.
- Tuolumne Utilities District (TUD) Phoenix Lake Preservation and Restoration Project—The project is intended to improve water quality conditions in the lake and the long-term health of the lake and its storage capacity by removing sediment and creating a sediment forebay and, as such, is expected to have a beneficial cumulative effect on surface hydrology and water quality.

Some projects will generally improve water supply conditions and have a beneficial effect on the surface hydrology and water quality and groundwater resources in the plan area. As such, these projects are not expected to contribute to significant effects in the plan area. Examples of such projects include the following.

- Bay Area Water Quality and Supply Reliability Program—This program identifies regional opportunities for the participating Bay Area water agencies to improve water supply and water quality for the benefit of the entire Bay Area.
- City of Stockton Delta Water Supply Project (DWSP)—Completed in 2012, this project pumps water from the Delta through miles of underground pipeline, along Eight Mile Road to a surface water treatment plant, to provide a new supplemental, high-quality water supply for Stockton.

- City of Tracy Connection to the South San Joaquin Irrigation District (SSJID)—Completed in 2009, the City of Tracy's second connection to the SSJID water line allows the City to receive additional potable water.
- Eastern San Joaquin Integrated Conjunctive Use (ICU) Program—This project would develop approximately 140–160 TAF per year of new surface water supply for the basin to directly and indirectly support conjunctive use by Northeastern San Joaquin County Groundwater Banking Authority (GBA) member agencies. This amount of water would support groundwater recharge consistent with the GBA's objectives for conjunctive use and the underlying groundwater basin. The GBA approved the ICU Program in February, 2011.
- New Exchequer Spillway Modification—This project on the Merced River would increase the height of the existing spillway gates and un-gated spillway by 8 to 10 feet, which would increase the storage capacity of Lake McClure.

Projects with No Significant Adverse Effects

Certain plans and policies like the California Water Plan establish policy and direction for the management of the state's water resources. As discussed below, the plan would not result in environmental effects and, therefore, would not contribute to any cumulative effects.

- California Water Plan—This strategic plan for managing and developing the state's water resources provides a planning framework for water managers, elected officials, agencies, tribes, businesses, stakeholders, and the public to develop findings and recommendations and make decisions regarding California's water future. The water plan is updated every 5 years. The water plan does not mandate action or authorize spending for actions. It also does not include environmental review and documentation as would be required under CEQA. Because the water plan does not cause environmental impacts, it would not contribute to cumulative effects.

17.2.2 Cumulative Impact Analysis

This section describes, analyzes, and determines the potential cumulative impacts of the LSJR and SDWQ alternatives within the plan area, as appropriate for each resource area, which could result from the implementation of the proposed plan amendments and the projects summarized in Table 17-1. This section also describes, analyzes, and determines the potential cumulative impacts of the LSJR alternatives in the extended plan area, as appropriate for each resource area. As discussed previously, the SDWQ alternatives would not have impacts in the extended plan area because (1) flows in the extended plan area are not expected to change in response to the SDWQ alternatives, and (2) the extended plan area is far upstream from the southern Delta, which means that any change in the salinity conditions in the southern Delta would not affect the water quality in the extended plan area. As such, no cumulative impact is associated with the SDWQ alternatives in the extended plan area and, therefore, the SDWQ alternatives in relation to the extended plan area are not discussed further in this section. The resource areas in this section correspond with the resource chapters (Chapters 5–14) of this SED. As stated above, the cumulative impacts associated with the No Project Alternative (LSJR/SDWQ Alternative 1) are discussed in Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1)*.

Surface Hydrology and Water Quality

As stated in Chapter 5, *Surface Hydrology and Water Quality*, LSJR Alternatives 2, 3, and 4 and SDWQ Alternatives 2 and 3 would have a less-than-significant impact on the surface hydrology and water quality resources in the plan area and extended plan area.

The impacts considered in Chapter 5 are as follows.

- Impact WQ-1: Violate water quality standards by increasing the number of months with electric conductivity (EC) above the water quality objectives for salinity at Vernalis or southern Delta compliance stations
- Impact WQ-2: Substantially degrade water quality by increasing Vernalis or southern Delta salinity (EC) such that agricultural beneficial uses are impaired
- Impact WQ-3: Substantially degrade water quality by increasing pollutant concentrations caused by reduced river flows

Overall, the LSJR alternatives would cause flows to increase, which would reduce pollutant concentrations and improve any current chronic water quality problems. Higher flows would also result in an overall decrease in salinity concentrations in the southern Delta. However, flows would be variable and would sometimes be lower than under baseline. Other projects that could result in cumulative effects have the potential to degrade water quality either through the reduction of dilution flows, changing hydrodynamic conditions in the Delta, or through the addition of pollutants. As discussed in Chapter 5, upstream of the rim dams,[2] river flows would also increase and reduce pollutant concentrations under the LSJR alternatives, and reservoir level changes would not change or increase pollutant concentrations. There would be no cumulative water quality impacts upstream of the rim dams. In the plan area, the SDWQ alternatives would only have an effect on WQ-1 by changing the EC standard, thereby reducing the number of exceedances of the standard. Otherwise, the SDWQ alternatives would have no impact. Therefore, the SDWQ alternatives would not cause a significant cumulative impacts and are not discussed further in this section.

Projects could result in a cumulative effect on water quality if they violate water quality standards by increasing the number of months with salinity (EC) above the water quality objectives for salinity at Vernalis or southern Delta compliance stations (Impact WQ-1) or substantially degrade water quality by increasing Vernalis or southern Delta EC such that agricultural beneficial uses are impaired (Impact WQ-2). Accordingly, with respect to these impacts, the geographic scope of this cumulative analysis focuses on projects within the area comprising Vernalis and the southern Delta and that have the potential to increase EC through the reduction of dilution flows, changes in hydrodynamic conditions in the Delta, or the addition of pollutants elsewhere in the plan area. The geographic scope also includes the Stanislaus, Tuolumne and Merced Rivers in the plan area and the extended plan area because these are the areas where water quality degradation impacts could occur (Impact WQ-3).

EC values in the southern Delta are primarily affected by the salinity of water flowing into the southern Delta from the SJR at Vernalis, salt discharged back into southern Delta channels that was previously diverted for irrigation, the combined CVP and SWP pumping influencing salinity in the

[2] In this document, the term *rim dams* is used when referencing the three major dams and reservoirs on each of the eastside tributaries: New Melones Dam and Reservoir on the Stanislaus River; New Don Pedro Dam and Reservoir on the Tuolumne River; and New Exchequer Dam and Lake McClure on the Merced River.

southern Delta, and tidal mixing of inflow from the Pacific Ocean. Municipal treated wastewater discharges may have ~~some~~ a minor effect on the southern Delta salinity. The LSJR flow at Vernalis has a large effect on the LSJR salinity at Vernalis. Following a dilution relationship in which salinity is inversely proportional to the flow, higher flows generally reduce salinity. Increased CVP and SWP pumping could also affect southern Delta salinity by bringing more low-salinity Sacramento River water across the Delta to the export pumps. However, periods of low Delta outflow (in the fall months) could cause increased seawater intrusion and higher EC at the southern Delta export intakes for the CVP and SWP.

Past and present cumulative projects that have contributed to elevated salinity in the southern Delta are discussed in more detail in the environmental setting section of Chapter 5. Examples of such projects that affect salinity in the southern Delta include the operation of the SWP and CVP, which alter the hydrodynamics in the southern Delta, development of irrigated agricultural lands, water diversions, and discharges from publicly owned treatment works (POTWs) in the southern Delta and in the LSJR upstream of Vernalis.

In general, future actions that could cumulatively affect water quality in the southern Delta resulting in elevated salinity are similar to the past and present projects and include new water diversions, water transfers, changes to SWP and CVP pumping, and changes to discharges from POTWs and agricultural lands. Past, present, and reasonably foreseeable probable future projects, described in Table 17-1, may have effects on surface hydrology and water quality resources through the following mechanisms.

- Change in circulation patterns in the southern Delta such that the mixture of low and high salinity water changes, resulting in higher salinity in the southern Delta (this is limited to an analysis of projects in the southern Delta).
- Change in flow and salt discharges into the southern Delta (this is limited to projects in the southern Delta and projects in the SJR Watershed that increase salt discharges).
- Degradation of water quality by increasing pollutant concentrations caused by reduced river flows in the plan area.

Projects, described in Table 17-1, that could change circulation patterns in the southern Delta include the following.

- California WaterFix
- Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) and Central Valley-wide Salt and Nitrate Management Plan (SNMP)
- Delta Stewardship Council (DSC) Delta Plan
- NMFS BO (for salmon)
- USFWS BO (for delta smelt)
- Update to the 2006 Bay-Delta Water Plan, Phase II

These projects could directly reduce circulation of water in the southern Delta, and thereby reduce dilution of locally saline water, which could result in increased salinity in southern Delta channels. For example, California WaterFix, which calls for the construction of facilities to divert water from the Delta at a location on the Sacramento River, could result in increased salinity in southern Delta channels if less low salinity water is pumped at the existing export facilities in the southern Delta.

Additionally, projects intended to protect endangered species (e.g., salmon and delta smelt) could also increase salinity in the southern Delta. The NMFS BO and the USFWS BO (collectively the "BOs") would place constraints on the future operation of the SWP and CVP and could reduce the quantity of low salinity water pumped across the Delta into the southern Delta, thereby resulting in increased salinity in the southern Delta. Similarly, future updates to the 2006 Bay-Delta Water Plan, Phase II could place conditions on the CVP and SWP that would reduce exports at the facilities operated by the California Department of Water Resources (DWR) and USBR, or other conditions on DWR, USBR, and other water right holders that would change the quantity of low salinity water flowing into southern Delta channels, and thereby increase salinity in the southern Delta. Additionally, although the Delta Plan would not directly result in regulatory approvals, actions, or other projects, it could result in other agencies or entities taking future actions. For example, the Delta Plan could recommend and require consistency determinations for projects that may affect circulations patterns in the southern Delta, thereby indirectly affecting the surface hydrology and water quality resources.

Projects, described in Table 17-1, that change flow and salt discharges into the southern Delta include the following.

- CV-SALTS

As described in Table 17-1, CV-SALTS includes the development of new salinity objectives for the LSJR upstream of Vernalis and a program of implementation to achieve these objectives. It could affect the timing of salt discharges to the LSJR, which could result in increased salinity in the SJR and increased salinity in the southern Delta.

Projects that reduce river flows could result in significant cumulative impacts by substantially degrading water quality by increasing pollutant concentrations caused by reduced river flows (Impact WQ-3). Projects, described in Table 17-1, that could change flow patterns and degrade water quality by increasing pollutant concentrations caused by reduced river flows include the following.

- Groundwater recharge projects
- Water transfers

Groundwater recharge projects would typically operate at times of high flows. However, if they were to operate during relatively low flow periods, the projects could result in lower flows. The resulting decreased inflow of low salinity water into the southern Delta could result in higher concentration of pollutants in the SJR and increased salinity in the southern Delta. While water transfers would tend to increase flows, the transfers could include a flow shifting component that would reduce flows outside the transfer period. In such cases, salinity would be improved as a result of increased low salinity water at the time of the transfer; however, salinity may increase at other times due to lower flows outside of the transfer period. Additionally, wastewater change petitions could result in lower flows during already low flow periods.

Of those projects discussed above where the State Water Resources Control Board (State Water Board) has approval authority (e.g., California WaterFix, WWCPs, and groundwater recharge projects), it would be required to consider and implement water quality objectives for salinity and other pollutants such that objectives are not exceeded. Notwithstanding this, given the condition of the surface hydrology and water quality in the plan area, the impacts of past, present, and reasonably foreseeable probable future projects on water quality are cumulatively significant.

However, the LSJR alternatives would generally increase river flows on the three eastside tributaries, as compared to baseline conditions for February–June, and there are only small changes in flow expected outside of these months. Increases in flow typically result in lower salinity levels, and therefore would not cause an increase in exceedances of existing (or proposed) water quality objectives nor result in an impact on the agricultural beneficial use, as discussed for Impacts WQ-1 and WQ-2, respectively, in Chapter 5. Additionally, as discussed for Impact WQ-3, the general increase in flow would typically result in lower concentrations of pollutants.

Therefore, LSJR Alternative 2, 3, and 4 would not result in a cumulatively considerable[3] incremental contribution to cumulative impacts or significant cumulative impacts related to salinity and water quality degradation, and cumulatively adverse impacts would be less than significant.

In the extended plan area, surface hydrology and water quality would not be degraded and violation of water quality standards would not occur as a result of the LSJR alternatives. As described in Chapter 5, Section 5.4.4*, Impacts and Mitigation Measures: Extended Plan Area,* water quality in the upstream Stanislaus, Tuolumne, and Merced Rivers is generally high quality and there is a relatively small volume of water that could be affected by LSJR Alternatives 2, 3, and 4 in the extended plan area on the three eastside tributaries. In general these alternatives would cause flows to increase, which would reduce concentrations and improve any chronic water quality problems. In addition, upstream reservoirs in the Stanislaus and Tuolumne Watersheds is generally high quality (there are no substantial reservoirs upstream on the Merced River). Furthermore, reservoir volume reductions would have minimal effects on most water quality constituents (e.g., mercury) because the reduction in storage would result from water (and the constituent) flowing out of the reservoir. In other words, the concentrations of water quality constituents would not change or increase relative to baseline and it is unlikely that the water quality would be degraded. Past, present and reasonably foreseeable probable future projects identified in Table 17-1 that could affect surface hydrology and water quality in the extended plan area include the Phoenix Lake Preservation and Restoration Project and the Lyons Reservoir Modification. The Phoenix Lake Preservation and Restoration project is expected to result in an overall benefit to surface hydrology and water quality by controlling and capturing sediment. Therefore, LSJR Alternative 2, 3, and 4 would not result in a cumulatively considerable incremental contribution to cumulative impacts or significant cumulative impacts related to surface hydrology and water quality degradation.

Flooding, Sediment, and Erosion

As stated in Chapter 6, *Flooding, Sediment, and Erosion*, LSJR Alternatives 2, 3, and 4 would have a less-than-significant impact on flooding, sediment, and erosion in the plan area and extended plan area. Under the SDWQ alternatives, salinity would generally remain the same as baseline conditions; furthermore, change in water quality does not affect flooding, sedimentation, or erosion. As such, SDWQ Alternatives 2 and 3 would have no impact on the flooding, sediment, and erosion and, therefore, are not considered further in this section.

The impacts considered in Chapter 6 are as follows.

[3] *Cumulatively considerable* means that the incremental effects of an individual project are significant when viewed in connection with the effects of past, current, and probably future projects. (Cal. Code Regs., tit 14, § 15065, subd. (a)(3).)

- Impact FLO-1: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or offsite
- Impact FLO-2: Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or offsite

The geographic scope of this cumulative analysis focuses on projects within the plan area and the extended plan area since it is where impacts could occur, in addition to the larger SJR Basin, because activities within the larger basin could affect sedimentation and flooding.

The LSJR alternatives would change flow patterns in rivers throughout the plan area and extended plan area. However, the range of flows would be similar to flows that occur under baseline conditions. Therefore, the amount of sediment and gravel transported at higher flows and flows that exceed channel capacities are expected to be similar to baseline conditions.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on flooding, sediment, and erosion through the following mechanisms.

- Alteration of drainage patterns, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or offsite.
- Alteration of existing drainage patterns, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding.

Habitat restoration or other projects that involve construction in or adjacent to channels may alter of the course of a stream or river, through changes in floodplain geometry, such that substantial erosion or siltation on- or off-site may occur. Following is a list of such projects, which are described in Table 17-1.

- California EcoRestore
- Central Valley Project Improvement Act projects
- Dos Rios Ranch
- Gravel Mining Reach Floodway Restoration
- Habitat Restoration Plan for the Lower Tuolumne River Corridor
- Knights Ferry Floodplain and Side-Channel Restoration
- Lower Tuolumne River Big Bend Project
- Restoration of the Ruddy Mining Reach
- Spawning Gravel Supplementation (Stanislaus County, Tuolumne River)
- Tuolumne River Restoration projects, including Warner Deardorff Segment—Mining Reach Project No. 3

California EcoRestore will include many smaller habitat restoration projects that are mostly outside the plan area, but some projects may be implemented in the southern Delta portion of the plan area. The Central Valley Improvement Act includes a suite of habitat restoration projects and actions in the Central Valley, including within the plan area. Other projects, such as Dos Rios Ranch, Habitat

Restoration Plan for the Lower Tuolumne River Corridor, Knights Ferry Floodplain and Side-Channel Restoration, and other listed projects, will restore habitat in floodplains, add sinuous reaches similar to natural channels, and add gravel that can be moved by moderate to high flows. These projects could alter the course of water flowing in a river or stream, but the changes would be similar to existing natural channels, as would sedimentation levels. To the extent that these projects occur in floodplains within the plan area, the projects could also have short-term construction-related impacts that could result in erosion. However, these effects would likely be less than significant because the projects would employ standard construction practices (e.g., erosion control and best management practices). Moreover, the floodplain restoration projects would allow water to spread across a wider area, thus relieving constricted channels of flow that cause erosion or siltation. The gravel added by these projects would move more often, particularly under LSJR Alternatives 3 and 4 (Chapter 6, Tables 6-10, 6-11, and 6-12). However, the amount of gravel (in the upper reaches) and sand (in the mid- to lower reaches) movement and bank erosion would not be any greater than analyzed in Chapter 6, Section 6.4.3, *Impacts and Mitigation Measures*, and, therefore, would not result in significant impacts on flooding, erosion, or sedimentation. Additionally, these restoration activities are not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential. Therefore, the incremental contribution of LSJR Alternatives 2, 3, and 4 would not be cumulatively considerable, and impacts would be less than significant.

Other projects, described in Table 17-1, that may involve both habitat restoration and changes in flows that could result in substantial erosion or siltation on- or offsite or flooding include the following.

- DSC Delta Plan
- Federal Energy Regulatory Commission (FERC) Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of the Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- Upper San Joaquin River Restoration Project (SJRRP), including Water Year 2010 Interim Flows Project
- Water transfers

As mentioned previously, the Delta Plan would not directly result in regulatory approvals, actions, or other projects, but could result in other agencies or entities taking future actions. The Delta Plan could affect the flooding, sedimentation, and erosion resources by recommending projects that involve habitat restoration or flow augmentation that are similar, in nature and effect, to the habitat restoration and flow augmentation projects described above. However, these restoration activities and flow augmentation projects are not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential.

The FERC projects would include the flows associated with the LSJR alternatives and any other flow adopted by FERC. Specifically, FERC projects undergoing relicensing must comply with conditions of water quality certification, such as the LSJR flow requirements, and any other minimum or bypass flows imposed through the relicensing process. However, these flows on the Tuolumne and Merced Rivers are not expected to increase peak flows in a way that would cause sufficient gravel transport to erode and undermine river levees. As such, the effects would not be substantially different from

those analyzed in Chapter 6. While the FERC projects could include habitat restoration elements, the projects would focus on the upper gravel-bedded portions of these tributaries and, therefore, are not expected to result in levee instability or exceedance of existing channel capacities. Ongoing physical salmon habitat restoration activities located in the upper, gravel-dominated reaches on the tributary generally take place where past in-channel and channel-adjacent gravel mining has simplified the channel configuration and aquatic habitat, and reduced gravel transport. As such, these restoration activities are not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential.

Through the augmentation of flows in reaches of the SJR that have not recently had such levels of flow, the Upper SJRRP could increase the seepage and flooding potential. However, these effects would occur in the SJR upstream of the Merced River confluence and, thus, the LSJR alternatives would not contribute to these impacts. Additionally, the restoration flows expected on the SJR downstream of the Merced River confluence would be well below the channel capacities along the LSJR and in the southern Delta (Figure 6-3 in Chapter 6), and, thus, are not expected to result in a change to levee stability, flooding potential, or sediment and erosion potential.

Water transfers could increase flows; however, the increases would be well within normal channel capacities of the three eastside tributaries and the LSJR. As such, the transfers are not expected to result in a change to the levee stability, flooding potential, or the sediment and erosion potential. Consequently, even if expected levee improvements do not occur, these flows would not significantly impact flood flows, channel stability, or levees (DWR 2012).

Flows in the three eastside tributaries and LSJR are controlled by reservoir operations except during the highest flood flows in large storm events and occasionally when levees are breached (Appendix C, *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*; McBain and Trush 2002; DWR 2010, 2011, 2012). Furthermore, dams, irrigation water use, river bank protection, and levees maintain the rivers within their banks and reduce sediment transport and channel migration. Consequently, past, present, and reasonably foreseeable probable future projects would not result in cumulatively significant impacts on flooding, sediment, and erosion resources.

Cumulatively considerable impacts would not occur as a result of the LSJR alternatives. Flows would generally remain within existing flood channels and would not result in substantial alterations of the existing drainage patterns, substantial erosion or siltation, or substantial increases in bank erosion or mobilization of sediment. Also, flows would not result in a substantial increase in the rate or amount of surface runoff in a manner that would result in flooding. Flows imposed through the FERC process, which would include the flows associated with the LSJR alternatives and any other flow adopted by FERC, are not expected to increase peak flows in a way that would cause sufficient gravel transport to erode and undermine river levees. Therefore, the effects would not be substantially different from those analyzed in Chapter 6, Section 6.4.3, *Impacts and Mitigation Measures*.

Similarly, the restoration flows on the SJR below Friant Dam combined with the LSJR alternatives on the three eastside tributaries would generally be well below the channel capacities along the LSJR and in the southern Delta (Figure 6-3 in Chapter 6). The SJR restoration flows would increase average river flows but not peak flows associated with flood control releases during storm events. Consequently, even if expected levee improvements do not take place, these flows would not significantly impact flood flows, channel stability, or levees (DWR 2012). Projects implementing

flood control measures, channel widening, or flood bypass would all reduce the potential for large flows to affect flooding.

Therefore, LSJR Alternatives 2, 3, and 4 would not result in a cumulatively considerable incremental contribution to cumulative impacts or significant cumulative impacts related to flooding, sedimentation, and erosion, and cumulatively adverse impacts would be less than significant.

In the extended plan area, flooding, sedimentation, and erosion would not occur as a result of the LSJR alternatives. As described in Chapter 6, Section 6.4.4*, Impacts and Mitigation Measures: Extended Plan Area*, there could potentially be more storage capacity under these alternatives on the Stanislaus and Tuolumne Rivers, which would help reduce flooding. Furthermore, the river channels on the Stanislaus, Tuolumne, and Merced Rivers are primarily contained in bedrock and would have minimal potential for increased sediment transport, erosion, or flooding under the LSJR Alternatives 2, 3, and 4. Past, present, and reasonably foreseeable probable future projects identified on Table 17-1 that could affect flooding, sediment, and erosion include the FERC Relicensing of Lyons Reservoir and the FERC Relicensing of the Don Pedro Hydroelectric Project, which could potentially affect operations of the CCSF/Hetch Hetchy reservoir system, upstream of New Don Pedro Reservoir in the extended plan area. FERC projects undergoing relicensing must comply with conditions of water quality certification, such as the LSJR flow requirements, and any other minimum or bypass flows imposed through the relicensing process. However, similar to the FERC relicensing in the plan area, the flows on the Stanislaus and Tuolumne Rivers are not expected to increase peak flows in a way that would cause sufficient gravel transport to erode and undermine existing river banks. Under the new licenses, these reservoirs would be operated consistent with flood control standards and rules. Therefore, LSJR Alternative 2, 3, and 4 would not result in a cumulatively considerable incremental contribution to cumulative impacts or significant cumulative impacts related to flooding, sedimentation and erosion.

Aquatic Biological Resources

As stated in Chapter 7, *Aquatic Biological Resources*, LSJR Alternatives 2, 3, and 4 would have a less-than-significant impact on aquatic biological resources in the plan area and would have significant and unavoidable impacts in the extended plan area. Under the SDWQ alternatives, salinity would generally remain the same as baseline conditions. As such, SDWQ Alternatives 2 and 3 would have no impact on aquatic biological resources and, therefore, are not considered further in this section.

The impacts considered in Chapter 7 are as follows.

- Impact AQUA-1: Changes in spawning success and habitat availability for warmwater species resulting from changes in reservoir water levels
- Impact AQUA-2: Changes in availability of coldwater species reservoir habitat resulting from changes in reservoir storage
- Impact AQUA-3: Changes in quantity/quality of physical habitat for spawning and rearing resulting from changes in flow
- Impact AQUA-4: Changes in exposure of fish to suboptimal water temperatures resulting from changes in reservoir storage and releases
- Impact AQUA-5: Changes in exposure to pollutants resulting from changes in flow

- Impact AQUA-6: Changes in exposure to suspended sediment and turbidity resulting from changes in flow
- Impact AQUA-7: Changes in redd dewatering resulting from flow fluctuations
- Impact AQUA-8: Changes in spawning and rearing habitat quality resulting from changes in peak flows
- Impact AQUA-9: Changes in food availability resulting from changes in flow and floodplain inundation
- Impact AQUA-10: Changes in predation risk resulting from changes in flow and water temperature
- Impact AQUA-11: Changes in disease risk resulting from changes in water temperature
- Impact AQUA-12: Changes in southern Delta and estuarine habitat resulting from changes in SJR inflows and export effects

In general, the LSJR alternatives would increase flows and decrease reservoir levels in both the plan area and the extended plan area. This could affect reservoir operations on the Stanislaus, Tuolumne, and Merced Rivers, flows in each of these tributaries, and flows in the LSJR and Delta, which could result in impacts on aquatic habitat and aquatic biological communities, including native and nonnative fish species. Reservoir operations of the major rim dams and flows in the three eastside tributaries downstream of these dams would generally fall within the ranges observed under baseline, and there would be general improvement (increase) in stream flows under the LSJR alternatives, relative to baseline. Therefore, the LSJR alternatives would have a less-than-significant impact on aquatic biological resources in the plan area. However, the LSJR alternatives could have a significant and unavoidable impact in the extended plan area because reservoirs upstream of the major rim dams in the extended plan area are smaller than the downstream rim reservoirs, potentially magnifying individual changes. Furthermore, required bypass flows may reduce the opportunity for these reservoirs to refill once they are drawn down. Reservoir drawdown could reduce the area and volume of water available for in-reservoir aquatic habitat, thereby affecting aquatic species, including fish. In addition, lower storage in the upstream reservoirs could result in increased water temperatures.

The LSJR alternatives could also affect flows in the southern Delta. The southern Delta is part of the larger Bay-Delta system and provides habitat for resident and migratory fish species. Essential habitats for salmonids and other fish species rely upon suitable water quality and water quantity conditions. For salmonids, these conditions must support juvenile and adult physiological transitions between fresh water and saltwater (NMFS 2009). Changes to estuarine habitat that degrade any of these conditions could have a negative effect on aquatic biological resources. Therefore, stressors similar to those described above for the three eastside tributaries and LSJR could influence the abundance and presence of fish in the southern Delta and Bay-Delta. In addition, conditions in the southern Delta are influenced by river inflow, tidal action, SWP and CVP water export facilities, local pump diversions, and agricultural and municipal return flows (Moyle 2002). Therefore, the geographic scope of this cumulative analysis focuses on projects within the three eastside tributaries in the plan area and the extended plan area, the three rim reservoirs, and the southern Delta.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on aquatic biological resources through the following mechanisms.

- Reduction of flows or change in reservoir operations in a manner that could change aquatic habitat availability and water temperatures and expose indicator species to pollutants and suspended sediments.
- Have an effect on habitat quality in the southern Delta by changing flows and circulation patterns in the southern Delta.

Projects, described in Table 17-1, that may reduce flows or change reservoir operations in a manner that could change habitat availability, water temperatures, and exposure to pollutants and suspended sediments for indicator species in the plan area and extended plan area include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of the Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- Groundwater recharge projects
- NMFS BO (salmon, steelhead, sturgeon)
- Upper SJRRP, including Water Year 2010 Interim Flows Project
- Water transfers

The FERC projects would include the flows associated with the LSJR alternatives and any other flow adopted by FERC. However, these flows on the Tuolumne and Merced Rivers are not expected to change flows and reservoir storage in a way that would have effects substantially different from those analyzed in Chapter 7. NMFS BO actions include implementation of a year-round minimum flow regime that improves conditions for steelhead in the Stanislaus River, which has the potential to change reservoir storage levels in New Melones Reservoir on the Stanislaus River. However, reservoir storage is not expected to vary in a way that would have effects substantially different from those analyzed in Chapter 7. While groundwater recharge projects and water transfers have the potential to reduce the quantity of water that remains in the three eastside tributaries and the LSJR, the unimpaired flow requirements under the LSJR alternatives would still have to be maintained. Thus, flows are not expected to vary in a way that would have effects substantially different from those analyzed in Chapter 7. Lastly, although augmented flows in reaches of the SJR under the Upper SJRRP could increase the movement of contaminants into the LSJR and affect temperatures, these changes would have a less-than-significant impact on fall-run Chinook salmon and other native fishes. The increased flows would dilute existing levels of pollutants from agricultural runoff currently found in the river (e.g., Upper SJR to the confluence of the Merced) and modeling results of the Upper SJRRP determined little difference between baseline and the interim and restoration flow conditions. In addition, mobilization of pollutants is not expected because certain areas along the river would receive delivery of interim and restoration flows instead of existing CVP supplies. Furthermore, the increased flows under the LSJR alternatives would reduce any increased temperature effect that may occur as a result of the Upper SJRRP.

Projects, described in Table 17-1, that may have an effect on aquatic biological resources by changing flows and circulation patterns in the southern Delta include the following.

- California WaterFix
- NMFS BO

- USFWS BO (delta smelt)
- Update to the 2006 Bay-Delta Water Plan, Phase II

The NMFS and USFWS BOs are meant to protect fish listed under ESA from being jeopardized by the adverse effects of SWP and CVP export water operations by, at times, requiring reservoir releases, pumping reductions, or both, as well as habitat restoration and other actions. While reservoir releases and pumping reductions would reduce direct impacts on fish, less Sacramento River water could be drawn into the southern Delta, which could increase salinity. California WaterFix proposes new SWP Delta facilities, including three new screened intakes in the northern Delta that could be operated at least partially in lieu of existing SWP and CVP southern Delta pumping. California WaterFix could reduce entrainment and impingement of estuarine species in the southern Delta from existing SWP and CVP operations but could also change south Delta water circulation and salinity by reducing the amount of Sacramento River water drawn into the southern Delta compared to baseline. Furthermore, the update to the 2006 Bay-Delta Water Plan, Phase II could require greater Delta inflows, greater Delta outflows, or both, which could change south Delta water circulation and salinity.

The operations of the SWP and CVP are conditioned to meet the criteria in the 2006 *Water Quality Control Plan for the San Francisco/Sacramento-San Joaquin Delta Estuary* (2006 Bay-Delta Plan), and would continue to be conditioned to meet any updates to the Bay-Delta Plan, including through future State Water Board water right actions. As new points of diversion for the SWP, California WaterFix must seek permits from the State Water Board. Such permits would be conditioned to ensure that aquatic biological resources are protected consistent with Bay-Delta Plan requirements. The update to the 2006 Bay-Delta Water Plan, Phase II must reasonably protect fish and wildlife beneficial uses. Therefore, the range of salinity levels and circulation patterns in the southern Delta are not expected to be substantially different from those analyzed in Chapter 7. Moreover, indicator species are historically adapted to much greater fluctuations in salinity than those required under the Bay-Delta Plan to protect southern Delta agricultural beneficial uses. Considering the combined impacts of past, present, the above-discussed projects and the LSJR alternatives, there would not be a significant cumulative impact on aquatic biological resources in the plan area. The combined effects on flow, which are necessary for habitat, temperature, water quality and circulation, and on reservoir levels at the rim dams are not expected to vary in a way that would have effects substantially different from those analyzed in Chapter 7. Moreover, there will be an overall increase in stream flows under LSJR alternatives. Therefore, LSJR Alternative 2, 3, and 4 would not result in a cumulatively considerable incremental contribution to significant cumulative impacts related to aquatic biological resources in the plan area.

However, significant cumulative impacts in the extended plan area could occur as a result of the LSJR alternatives. Similar to the plan area, past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on aquatic biological resources if they reduce flows or change reservoir operations in a manner that could change aquatic habitat availability and water temperatures and expose indicator species to pollutants and suspended sediments. Projects, described in Table 17-1, that may result in these types of impacts include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of Lyons Reservoir
- San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy Repair and Rehabilitation Program and Lower Cherry Aqueduct Emergency Rehabilitation

- TUD Phoenix Lake Preservation and Restoration project

These projects have the ability to modify the flow regime in the extended plan area on the Stanislaus and Tuolumne Rivers. Changes in the storage requirements or operation of the reservoirs under FERC relicensing, reservoir modifications, or as a result of increased diversions could significantly affect aquatic biological species in the Stanislaus and Tuolumne Rivers. These past, present, and reasonably foreseeable future projects could store and then divert water in the summer and fall, when the LSJR alternatives may result in reduced flows, particularly in the fall, as a result of earlier bypasses in the year. If this were to occur, there would likely be increases in temperature and reductions in overall available aquatic habitat. As such, the incremental contribution to aquatic biological resource impacts from LSJR Alternative 2, with adaptive implementation, or LSJR Alternatives 3 or 4, with or without adaptive implementation, would be cumulatively considerable when viewed in connection with the potential changes to aquatic habitat, temperature, and flow on the Stanislaus and Tuolumne Rivers as a result of the projects identified above. Cumulative impacts on aquatic biological resources in the extended plan area would be significant. There is no other feasible mitigation measure beyond what is proposed in Section 7.4.3, *Impacts and Mitigation Measures*, to reduce this impact to less-than-significant levels and, therefore, the cumulative impact would remain significant and unavoidable.

Terrestrial Biological Resources

As stated in Chapter 8, *Terrestrial Biological Resources*, LSJR Alternatives 2, 3, and 4 would have a less-than-significant impact on terrestrial biological resources in the plan area, and would have significant and unavoidable impacts on terrestrial biological resources in the extended plan area. Under the SDWQ alternatives, salinity would generally remain the same as baseline conditions. As such, SDWQ Alternatives 2 and 3 would have no impact on terrestrial biological resources and therefore are not considered further in this section.

The impacts considered in Chapter 8 are as follows.

- Impact BIO-1: Have a substantial adverse effect on any riparian habitat or other sensitive natural terrestrial communities identified in local or regional plans, policies, or regulations or by the CDFW or USFWS
- Impact BIO-2: Have a substantial adverse effect on federally protected wetland as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrologic interruption, or other means
- Impact BIO-3: Facilitate a substantial increase in distribution and abundance of invasive plants or nonnative wildlife that would have a substantial adverse effect on native terrestrial species
- Impact BIO-4: Have a substantial adverse effect, either directly or through habitat modifications, on any terrestrial animal species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by CDFW or USFWS
- Impact BIO-5: Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan or conflict with any local policies or ordinances protecting biological resources

Overall, the LSJR alternatives would increase flows and decrease reservoir levels in both the plan area and the extended plan area. This could affect reservoir operations on the Stanislaus, Tuolumne, and Merced Rivers, flows in each of these tributaries, and flows in the LSJR and Delta, which

could result in potential impacts on terrestrial habitat and terrestrial biological communities, including native and invasive species. The geographic scope of this cumulative analysis focuses on projects within affected areas (i.e., the riparian habitat adjacent to river channels and reservoir shorelines and the areas subject to surface water level fluctuations around the three rim reservoirs) along the three eastside tributaries in the plan area and the extended plan area, the three rim reservoirs, and the southern Delta.

Past and present cumulative effects of projects that have contributed to a decline in the diversity and abundance of terrestrial species and their habitats are discussed in the environmental setting section of Chapter 8. In general, future actions that could cumulatively affect terrestrial biological resources are similar to past and present projects. Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on terrestrial biological resources through the following mechanisms.

- Change in reservoir levels on the three eastside tributaries.
- Increase in the variability of changes to river flow volumes and timing.
- Physical modification of areas within and adjacent to the river channels such that there could be a substantial adverse effect on habitat or species of interest.

Projects, described in Table 17-1, that could change reservoir water surface elevations or increase the variability of changes to river flow volumes and timing include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of the Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- NMFS BO (for salmon)
- Water transfers

The FERC projects would include the flows associated with the LSJR alternatives and any other flow adopted by FERC. However, these flows on the Tuolumne and Merced Rivers are not expected to change flows and reservoir storage in a way that would have effects substantially different from those analyzed in Chapter 8. NMFS biological opinion actions include implementation of a year-round minimum flow regime in the Stanislaus River, which has the potential to change reservoir storage levels in New Melones Reservoir. Additionally, while water transfers have the potential to reduce the quantity of water that remains in rivers in the plan area, the unimpaired flow requirements under the LSJR alternatives would still have to be maintained. Thus, flows are not expected to vary in a way that would have effects substantially different from those analyzed in Chapter 8.

Habitat restoration projects, habitat conservation plans, and other projects that involve construction in or adjacent to channels may alter the course of a stream or river or the adjacent habitat. In general, these projects are intended to benefit terrestrial biological resources by replacing riparian habitat that has been lost. Following is a list of such projects, which are described in Table 17-1.

- California EcoRestore
- Central Valley Project Improvement Act projects
- Dos Rios Ranch

- Gravel Mining Reach Floodway Restoration
- Habitat Restoration Project for the Lower Tuolumne River Corridor
- Knights Ferry Floodplain and Side-Channel Restoration
- Lower Tuolumne River Big Bend Project
- Merced River Ranch Floodplain Restoration
- Proposed expansion of the SJR National Wildlife Refuge

Habitat restoration projects, habitat conservation plans, and other similar types of projects are meant to recover wildlife species and habitat (including some riparian, floodplain, and adjacent terrestrial habitats). These efforts would work in conjunction to support terrestrial species and replace habitat that has been lost that could benefit terrestrial species. Such projects may have some short-term impacts on sensitive terrestrial species and habitat, such as indirect effects associated with construction noise or temporary removal of habitat. However, any disturbance that may take place would be in accordance with best management practices and applicable laws and regulations, and would be temporary and localized. Furthermore, such projects likely would be implemented in drier periods when the LSJR alternatives are less likely to contribute to related impacts. Overall, the LSJR alternatives would generally result in higher flows in the SJR and the three eastside tributaries below the rim reservoirs during the February–June period and could change rim reservoir storage levels. However, these additional flows are not expected to have significant impacts on riparian habitat, wetlands, or other sensitive natural terrestrial communities (Impacts BIO-1 and BIO-2) along river channels because the plants located in these areas can survive inundation, are resistant to the effects of scouring and deposition, and are growth-limited by water availability. Furthermore, the fluctuations of water elevation in the three rim reservoirs would be minimal under the LSJR alternatives and are not expected to affect riparian habitat or wetlands surrounding the reservoirs. Because a substantial change in riparian habitat would not be expected, special-status animal species would not be adversely affected (Impact BIO-4). In addition, because the impacts on riparian habitat and the special-status animal species that are dependent on it would be less than significant, the LSJR alternatives would not conflict with any plans protecting these biological resources (Impact BIO-5). Lastly, while flow changes and fluctuations in reservoir elevations could cause alteration of vegetation patterns in specific locations, there is no basis to suggest that increased flows would substantially increase the distribution and abundance of invasive plant species (Impact BIO-3). The incremental contribution of the LSJR alternatives' impacts when viewed in connection with past, present and probable future projects, such as those discussed above, is not cumulatively considerable. As such, LSJR Alternatives 2, 3, and 4 would not result in significant cumulative impacts related to terrestrial biological resources.

As discussed in Chapter 5, *Surface Hydrology and Water Quality*, the LSJR alternatives would result in an overall slight reduction in salinity in the southern Delta. This impact would not be significant for riparian habitats and terrestrial wildlife and plant species which regularly tolerate fluctuation in salinity and experience tidal influences and salinity inputs from other sources. For example, native plant species in the southern Delta have adapted to brackish water and salinity levels that have historically existed in the southern Delta. Therefore, the incremental contribution of the LSJR alternatives would not be cumulatively considerable, and cumulative impacts would be less than significant in the southern Delta.

The area of potential effects for the extended plan area is similar to that of the plan area—it includes areas affected by fluctuations in reservoir levels and areas adjacent to the stream channels. However, in the extended plan area on the Stanislaus and Tuolumne Rivers, impacts of the LSJR alternatives for terrestrial biological resources would be potentially more significant than below the rim dams because the upstream reservoirs are smaller and the effects of potential changes in reservoir storage could be magnified. In particular, under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4, with or without adaptive implementation, the upstream reservoirs could experience substantial changes in reservoir volumes and surface water elevations that would not be experienced in the downstream rim reservoirs. In addition, channel flows in the extended plan area could decrease during the fall relative to baseline conditions since reservoirs have more open storage to fill. These changes could potentially result in reduced habitat conditions for terrestrial species along channel banks and reservoirs. Thus, as discussed in Chapter 8, the impacts associated with lower reservoir levels under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4, with or without adaptive implementation are significant and unavoidable.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on terrestrial biological resources in the extended plan area if they reduce flows or change reservoir operations in a manner that could change habitat availability adjacent to existing reservoirs on the Stanislaus and Tuolumne Rivers or adjacent to these rivers. In general, if projects lower reservoir elevations or river flows such that vegetation is reduced and wildlife habitat is reduced, significant impacts could occur. A reduction of river flows or reservoirs could occur if diversions were increased or operations changed to release more or less water during different times of the year. Projects, described in Table 17-1, that may result in these types of impacts include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of Lyons Reservoir
- San Francisco Public Utilities Commission (SFPUC) Hetch Hetchy Repair and Rehabilitation Program and Lower Cherry Aqueduct Emergency Rehabilitation
- TUD Phoenix Lake Preservation and Restoration project

If these projects result in potentially lower flows in the summer or fall, when there may be effects associated with LSJR Alternatives 2, with adaptive implementation, or LSJR Alternatives 3 or 4 with or without adaptive implementation, the incremental cumulative contribution would be cumulatively considerable when considered with past, present, and reasonably foreseeable projects, such as those discussed above. This would result in a significant cumulative impact upstream in the extended plan area. There is no other feasible mitigation measure beyond what is proposed in Chapter 8, Section 8.4.4, *Impacts and Mitigation Measures: Extended Plan Area,* to reduce this impact. Therefore, the cumulative impacts related to terrestrial biological resources in the extended plan area would remain cumulatively significant and unavoidable.

Groundwater Resources

As stated in Chapter 9, *Groundwater Resources*, LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4, with or without adaptive implementation, would have significant and unavoidable impacts on the groundwater resources in the plan area, while LSJR Alternative 2 without adaptive implementation would have a less-than-significant impact on groundwater resources in the plan area. LSJR Alternatives 2, 3, and 4 would have a less-than-significant impact on

groundwater resources in the extended plan area. The SDWQ alternatives would not result in a change in groundwater pumping or groundwater recharge from surface water that currently takes place. As such, SDWQ Alternatives 2 and 3 would have no impact on groundwater resources and, therefore, are not discussed further in this section.

The impacts considered in Chapter 9 are as follows.

- Impact GW-1: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge
- Impact GW-2: Cause subsidence as a result of groundwater depletion

Overall, the LSJR alternatives would reduce the amount of surface water available to those entities that currently divert surface water. To replace reduced surface water supplies, these entities could increase their reliance on groundwater, thereby increasing groundwater pumping and reducing groundwater recharge, relative to the baseline water balance, in the four groundwater subbasins underlying the plan area (the Eastern San Joaquin, Modesto, Turlock, and Extended Merced[4] Subbasins). Increased groundwater pumping could also result in groundwater quality impacts due to the potential for the migration of contamination and subsidence due to groundwater depletion. Other projects that could result in cumulative effects on groundwater resources would have the potential to deplete groundwater supplies either through increased groundwater pumping or interference with groundwater recharge.

Projects could result in a cumulative effect on groundwater resources if they increase reliance on groundwater, thereby depleting groundwater supplies or potentially interfering with groundwater recharge (Impact GW-1), which could also result in a potential migration of groundwater contamination, or if the increased groundwater pumping causes groundwater levels to decline such that there is an increased risk of subsidence (Impact GW-2). Accordingly, the geographic scope of this cumulative analysis on groundwater impacts focuses on projects within the four groundwater subbasins that underlie the plan area, as well as the extended plan area.

Groundwater levels in the four subbasins are primarily affected by inflows (i.e., natural and artificial recharge) and outflows (e.g., pumping and other discharges). Groundwater pumping has the greater impact on groundwater levels, especially as the subbasins have a long history of pumping more groundwater than the basins naturally recharge (i.e., overdraft). Reducing surface water availability could increase reliance on groundwater, as suppliers and groundwater users increase pumping to replace the lost surface water, thereby reducing groundwater levels. Lowering groundwater levels also has an effect on the risk of subsidence, especially in the Merced Subbasin, where there is evidence of subsidence (Sneed and Brandt 2015; Farr et al. 2015).

Past and present cumulative projects and activities that have contributed to declining groundwater levels in the four subbasins are discussed in the environmental setting section of Chapter 9. Examples of such activities that affect groundwater resources in the four groundwater basins include groundwater pumping for municipal, domestic, and agricultural uses (which has increased in recent decades), and the associated effects on groundwater quality by altered movement of groundwater contaminants towards wells.

[4] As defined in Chapter 9, *Groundwater Resources*, the Extended Merced Subbasin is the Merced Subbasin plus the small area of the Chowchilla Subbasins that is between the Merced Subbasin and the Chowchilla River.

In general, future actions that could cumulatively affect groundwater resources in the four groundwater subbasins underlying the plan area are similar to past and present projects and include new municipal, domestic, and agricultural development, including infrastructure. Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on groundwater resources through the following mechanisms.

- Increase reliance on groundwater resources to meet increased potable water supply demands, thereby reducing groundwater levels or reducing groundwater recharge (both of which could also increase the migration of contaminants) or increasing subsidence.
- Reduce surface water availability, thereby increasing reliance on groundwater and thus reducing groundwater levels or reducing groundwater recharge (both of which could also increase the migration of contaminants) or increasing subsidence.

Several of the projects described in Table 17-1 are expected to encourage population growth, which could increase total municipal and industrial water use demands in a region that has historically relied on groundwater supplies. The projected population growth associated with these projects could increase total water demand and could increase reliance on groundwater resources to meet increased potable water supply demands. These projects include the following.

- California High Speed Rail Project
- Merced County's Castle Airport Master Plan (AMP) for development of Castle Airport
- Modesto Regional Water Treatment Plant (MRWTP) Phase Two Expansion Project
- University of California (UC) Merced 2020 Project
- Proposed Merced County 2030 General Plan
- Proposed Stanislaus County General Plan Update

Due to varied responses to reduced surface water deliveries and differences in groundwater conditions in the subbasins, the impacts of these projects cannot be determined with certainty. However, because municipalities and suppliers within the subbasins have historically relied on groundwater for all or a portion of their water supply, it is reasonable to conclude that reliance on groundwater would increase as the total water demand increases. The increased reliance could result in increased groundwater pumping, which could lead to an overall decline in groundwater levels in the subbasins and the potential for contaminants to move towards wells. Additionally, because lowered groundwater levels is associated with an increased risk of subsidence, these and similar projects could also increase the risk of subsidence in the subbasins.

Similarly, projects that reduce surface water availability could also result in significant cumulative impacts by increasing dependence on groundwater, which, again, could lead to an overall decline in groundwater levels and the associated potential for contaminant movement and subsidence. Projects that reduce surface water availability could also interfere with groundwater recharge activities, as recharge typically only occurs when there is excess surface water. Projects, described in Table 17-1, that could reduce surface water availability include the following.

- Water transfers

Although water transfers would tend to increase flows, there could be a flow shifting component that reduces flows at other times outside the transfer period. Increased flows would not increase natural instream groundwater recharge as the transfers do not increase the surface area from which

recharge occurs. However, water transfers, which could involve transfers of water between entities within the plan area, transfers from outside the plan area to users within the plan area, or transfers from entities within the plan area to users outside the plan area, could result in a lowering of groundwater levels if groundwater is pumped in substitution for transferred water. Transfers could also reduce the availability of surface water for recharge activities if water that is transferred would otherwise have been injected into the aquifer or applied to spreading grounds where it could have percolated into the aquifer. Alternatively, water transfers could affect in-lieu groundwater recharge activities. Under in-lieu recharge programs, water users increase their surface water deliveries in order to temporarily decrease the amount of groundwater they pump from the aquifer. Decreased pumping allows natural recharge to accumulate in the underground aquifer for use during dry years. If water that otherwise would have been used to facilitate in-lieu recharge were to be transferred, then groundwater would still be pumped, which could result in a lowering of groundwater levels. The incremental contribution to groundwater resource impacts from LSJR Alternative 2 with adaptive implementation or LSJR Alternatives 3 or 4 with or without adaptive implementation would be cumulatively considerable when viewed in connection past, present, and probable future projects like the California High Speed Rail Project, the Castle AMP, the Modesto MRWTP Phase Two Expansion Project, the UC Merced 2020 Project, buildout under the proposed general plan updates for Merced and Stanislaus Counties, and water transfer projects. Cumulative impacts on groundwater resources in the plan area would be significant. There is no other feasible mitigation measure beyond what is proposed in Section 9.4.3, *Impacts and Mitigation Measures*, to reduce this impact to less-than-significant levels and, therefore, the cumulative impact would remain significant and unavoidable.

As discussed in Chapter 9, the geology in the extended plan area produces relatively small, localized, and isolated groundwater aquifers. This geology means that there is only one designated groundwater basin within the extended plan area, in Yosemite National Park, which has a relatively small amount of consumptive use. Given the small amount of consumptive use in the extended plan area, the LSJR alternatives would not significantly increase reliance on groundwater within the extended plan area, meaning that groundwater pumping is not anticipated to increase such that groundwater levels or recharge activities would be affected. Moreover, given the extended plan area geology and that groundwater pumping is not expected to significantly affect groundwater levels, there would be no significant risk of subsidence in the extended plan area or water quality impacts. The past, present, and reasonably foreseeable future projects identified in Table 17-1 do not have the potential to affect groundwater resources in the extended plan area because they are not expected to use existing groundwater resources in the extended plan area. As such, the LSJR alternatives' incremental contribution to cumulative impacts related to groundwater resources in the extended plan area would not be cumulatively considerable when viewed in connection with the effects of other past, present, and probable future projects

Recreational Resources and Aesthetics

As stated in Chapter 10, *Recreational Resources and Aesthetics*, LSJR Alternatives 2 and LSJR Alternative 3 without adaptive implementation would have a less-than-significant impact on recreation resources and aesthetics in the plan area, while LSJR Alternatives 3 with adaptive implementation and LSJR Alternative 4 with or without adaptive implementation would have significant and unavoidable impacts on recreational resources and aesthetics in the plan area. Within the extended plan area, LSJR Alternative 2 without adaptive implementation would have less-than-significant impacts on recreation resources and aesthetics, while LSJR Alternative 2 with

adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation would have significant and unavoidable impacts on recreational resources and aesthetics in the extended plan area. Under the SDWQ alternatives, water quality in the southern Delta is expected to remain within historical ranges; furthermore, any changes in salinity levels within historical ranges are expected to be imperceptible to recreationists. As such, SDWQ Alternatives 2 and 3 would have no impact on these resources and, therefore, are not considered further in this section.

The impacts considered in Chapter 10 are as follows.

- Impact REC-1: Substantially physically deteriorate existing recreational facilities on the rivers or at the reservoirs
- Impact REC-2: Substantially degrade the existing visual character or quality of the reservoirs

Overall, the LSJR alternatives would increase flows in the three eastside tributaries and decrease reservoir levels. Increases in flows may physically deteriorate the condition of existing recreation facilities at reservoirs or rivers. Because many recreation activities are limited to a range of flows (e.g., swimming, use of boat put-ins, access to picnic areas and campgrounds), a substantial increase in flows during the recreation season (May–September) could result in recreationists being unable to use the river for certain types of in-water and on-bank activities. The reductions in reservoir levels could increase the distance between established facilities and the water, which could reduce use of existing recreation facilities (e.g., as reservoir levels decline boat ramps become less accessible which could result in fewer boaters on the water). Reductions in reservoir levels could also increase the frequency with which the non-vegetated ring around the perimeter of the reservoir would be exposed, thereby affecting visual aesthetics. As discussed in Chapter 10, the LSJR alternatives would have greater impacts on recreational resources and aesthetics within the extended plan area than the plan area.

The geographic scope of this cumulative analysis focuses on projects within the plan area and the extended plan area because this is where recreational and visual effects could occur. The geographic scope also includes the SJR up to Friant Dam, as changes upstream could impact in-water recreation along the SJR within the plan area. The southern Delta is not included within the geographic scope, as the salinity water quality objectives would have no impact on visual and recreational resources.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on recreation resources and aesthetics through the following mechanisms.

- Drawdown of reservoir levels on the three eastside tributaries.
- Increase in the variability of changes to flow volumes and timing.

Projects, described in Table 17-1, that could draw down reservoir levels on the three eastside tributaries include the following FERC projects.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of the Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- FERC Relicensing of Lyons Reservoir
- TUD Phoenix Lake Preservation and Restoration project

The Don Pedro and Merced River and Merced Falls FERC Hydroelectric Projects would include the flows associated with LSJR alternatives and any other flow adopted by FERC. Specifically, FERC projects undergoing relicensing must comply with conditions of water quality certification, such as the LSJR flow requirements, and any other minimum or bypass flows imposed through the relicensing process. However, these flows on the Tuolumne and Merced River are not expected to increase peak flows in a way that would cause substantial physical deterioration of on-bank recreation facilities. The proposed relicensing of New Don Pedro Reservoir and Lake McClure would include the maintenance of recreational facilities and potential changes to the release of water from the reservoir for power generation. In addition, the proposed relicensing could include actions, such as: increased flow, changes in timing of flow within a month or flows at different times of the year, fish passage, and, temperature control devices. If New Don Pedro Reservoir and Lake McClure are managed to include these types of actions, it is expected that the reservoirs could experience drawdown conditions, which could impact recreation resources and aesthetics. However, these conditions would be similar to historic conditions, and recreational amenities could be managed to provide continued access to recreationists. Furthermore, viewers typically anticipate the change in water elevation that results in the bathtub-ring effect with little vegetation and sediment. As such, the effects would not be substantially different from those analyzed in Chapter 10 for the plan area. The Lyons Reservoir FERC relicensing and the Phoenix Lake Preservation and Restoration Project are also not expected to result in a change in peak flows. However, depending on the drawdown that may occur at these reservoirs under the restoration and new FERC license, recreational and aesthetic resources may be affected, particularly in the summertime during prime recreation periods. In addition, diversions under the relicensing could occur in the summer or fall, which could potentially reduce the volume of water in the reservoir or river, depending on the scheduled release of water and the need for it downstream. These types of impacts could also occur under the FERC relicensing of the Don Pedro Hydroelectric Project as it may affect the operations of the CCSF's Hetch Hetchy system if CCSF contributes water supply to meet instream flows imposed as a condition of water quality certification associated with the relicensing or otherwise imposed through the relicensing process.

Other projects, described in Table 17-1, that could increase the variability of changes to flow volumes and timing include the following.

- Water transfers

Water transfers have the potential to increase flows, but the increases would be well within normal channel capacities of the three eastside tributaries and the LSJR and so are not expected to result in an increase in inundation of on-bank recreation facilities or result in physical deterioration of the facilities. Additionally, the transfers are unlikely to result in reductions of reservoir levels to such an extent that recreation facilities would be affected or the visual aesthetics be degraded. Therefore, these flows would not significantly impact recreation resources and aesthetics. Lastly, the effects of water right actions that implement the LSJR alternatives are accounted for in the effects associated with the LSJR alternatives and, therefore, would not result in additional impacts.

Additionally, some recreation management and improvement projects that are unrelated to flow and water levels may nevertheless have related impacts on recreation. Following is a list of such projects, which are described in Table 17-1.

- Tuolumne Wild and Scenic River Comprehensive Management Plan
- Merced Wild & Scenic River Final Comprehensive Management Plan

- Central Valley Vision
- SJR Blueway Plan

While unrelated to flow and water levels, these and similar projects would be expected to modify and enhance on-bank and in-water recreational opportunities. Similar types of past and present projects have gradually increased pressure on recreational resources, extracted water from the LSJR and three eastside tributaries, and altered the natural environment, including through urbanization of the viewshed. However, the projects also increased the number of recreational opportunities for the general public along the three eastside tributaries, the LSJR, and at the reservoirs by developing trails, boat launches, campsites, and other recreational amenities. The above-listed projects are expected to increase the number of recreational facilities and opportunities along the rivers and reservoirs, and implement other actions to ensure flows on the rivers suitable for recreation purposes and to preserve scenic views. Because similar projects have generally developed and promoted recreation, they have not had significant impacts on recreational amenities. However, development around the reservoirs and urbanization of the watersheds have had significant impacts on the views and viewsheds experienced by recreationists.

LSJR Alternative 2 would continue to support flows that are optimal for all types of recreation on the three eastside tributaries for the majority of the recreational season (May–September) and on the LSJR and would not substantially physically deteriorate existing recreational facilities at the reservoirs. Additionally, LSJR Alternative 2 with or without adaptive implementation would not substantially decrease May–September reservoir elevations, resulting in visual impacts. The incremental cumulative contribution of LSJR Alternative 2 with or without adaptive implementation to impacts on recreational resources on the rivers and reservoirs would not be significant when considered in combination with the past, present, and reasonably foreseeable probable future projects such as those described above. Therefore, under LSJR Alternative 2 with or without adaptive implementation, cumulative impacts would not be significant.

Under LSJR Alternatives 3 and 4 without adaptive implementation, the seasonal average frequency of flows conducive to swimming and wading (i.e., flows less than 500 cubic feet per second [cfs]) would decrease more than 10 percent on the Merced and Tuolumne Rivers, primarily due to reductions in May and June. There would be little change in high flows on these rivers from July–September, during the warmest months in the San Joaquin Valley, when swimming and wading are most popular. Thus, in-water recreation conditions are not expected to be substantially reduced. Flows may increase over the baseline in the extended plan area due to bypass flows, affecting in-river recreation. However, as described above, reasonably foreseeable probable future projects in the plan area and extended plan area are expected to increase recreation opportunities. Therefore, under LSJR Alternatives 3 and 4 without adaptive implementation, the incremental contribution of these impacts would not be cumulatively considerable and would not result in a significant cumulative impact on in-river recreation.

River flows greater than 2,500 cfs would increase in frequency on the Tuolumne River in May and June, and could result in an increase in the frequency of inundation of on-bank recreation areas under LSJR Alternative 3 without adaptive implementation (specifically, method 1). This inundation is not anticipated to substantially physically deteriorate these recreation facilities because they are capable of withstanding periodic inundation. Under LSJR Alternative 3 with adaptive implementation and LSJR Alternative 4 with or without adaptive implementation, modeled frequencies of flows greater than 2,500 cfs would substantially increase in the three eastside tributaries. Similar recreation impacts from increased river flows may occur in the extended plan

area during bypass periods. Although on-bank recreation facilities on all of these rivers are purposefully built adjacent to, and within close proximity of, rivers and are able to withstand periodic inundation by higher flows, the frequency of flows predicted under these alternatives would likely result in much more frequent inundation of adjacent on-bank recreational facilities along these rivers relative to baseline, which is expected to contribute to substantial physical deterioration over time. Thus, the incremental contribution of LSJR Alternative 3 with adaptive implementation or LSJR Alternative 4 with or without adaptive implementation to the substantial physical deterioration of recreation facilities in the plan area and extended plan area over time would be cumulatively considerable when viewed in connection with the effects of the projects discussed above. As discussed in Chapter 10, Section 10.4.3, *Impacts and Mitigation Measures*, reducing flows could reduce this impact; however, such a reduction would directly contradict the purpose of these alternatives. In addition, the State Water Board has limited authority to impose mitigation measures on specific construction, operation, and maintenance of local recreational facilities to mitigate for the physical deterioration of recreation facilities. There are no other feasible mitigation measures the State Water Board can impose to reduce this impact to less–than-significant levels. As such, cumulative impacts related to recreational resources in the plan area and extended plan area would remain significant and unavoidable.

LSJR Alternative 3 without adaptive implementation and LSJR Alternative 4 without adaptive implementation are expected to cause a substantial decrease in May–September reservoir elevations at New Don Pedro Reservoir at the 30 percent cumulative distribution level for which increases in minimum reservoir elevations during the same period would not compensate. However, it is expected that this decrease would not substantially physically deteriorate existing recreation facilities at the reservoir, and all boat ramps would remain operable. Effects associated with reduced reservoir elevations at New Don Pedro Reservoir would be offset by increases in elevations under dry year conditions. Additionally, given the Class III designation of the views at New Don Pedro Reservoir (discussed in Chapter 10) and the typical fluctuations and the land-water interface experience of recreationists, the decrease in reservoir elevation is not expected to substantially degrade the visual quality. The incremental contribution of reduced elevations at New Don Pedro Reservoir would not be considered significant when considered with past, present, and reasonably foreseeable projects, such as those discussed above. Therefore, under LSJR Alternatives 3 and 4, the cumulative impact related to recreation and aesthetics in the plan area would not be significant. Elevations at New Melones Reservoir and Lake McClure would increase at the 30 percent cumulative distribution elevations under LSJR Alternatives 3 and 4, which would improve views such that there would be no significant cumulative impact.

In contrast to the discussion above, reduced reservoir elevations under LSJR Alternative 2, with adaptive implementation, and LSJR Alternatives 3 and 4 with or without adaptive implementation would potentially result in significant impacts on views and recreation and aesthetics, as discussed in in Chapter 10, Section 10.4.4, *Impacts and Mitigation Measures: Extended Plan Area,* in the extended plan area. The incremental cumulative contribution would be significant when considered with past, present, and reasonably foreseeable projects, such as those discussed above, and there would be a significant cumulative impact upstream of the rim dams. Reservoirs upstream of the rim dams are much smaller such that impacts would be more pronounced and cumulatively considerable than in downstream reservoirs, even considering increased recreational opportunities from other projects. There is no other feasible mitigation measure beyond what is proposed in Section 10.4.4 to reduce this impact and, therefore, the cumulative impact related to recreational resources in the extended plan area would remain significant and unavoidable.

Drawdown in upstream reservoir storage particularly under LSJR Alternatives 3 and 4, with or without adaptive implementation, but also under LSJR Alternative 2 with adaptive implementation, in the extended plan area could result in reduced flows in the fall on the Stanislaus and Tuolumne Rivers. If flows are reduced such that sensitive viewers (e.g., recreationists) cannot see water in the river, the river becomes less of a defining feature of the overall landscape. This could substantially degrade the visual character and quality of views of the Tuolumne River, many parts of which have been designated wild and scenic, and the Stanislaus River, which can be viewed from Scenic Highways 108 and 4. The incremental contribution would be cumulative considerable when viewed in connection with the effects of the projects discussed above, especially considering the sensitivity of the area. Therefore, the cumulative impact on aesthetics would be significant, even though higher spring flows and lower fall flows are reflective of what would occur in a natural system. Providing more flows in the fall would mitigate this impact; however, it is counter to the LSJR alternatives' purpose to provide additional flows during February–June to more closely mimic the natural hydrograph for the protection of fish and wildlife beneficial uses, and is therefore infeasible. There are no other feasible mitigation measures that the State Water Board may impose. As such, impacts related to the aesthetics in the extended plan area would remain cumulatively significant and unavoidable.

Agricultural Resources

As stated in Chapter 11, *Agricultural Resources*, LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation would have significant and unavoidable impacts on the agricultural resources in the plan area, while LSJR Alternative 2 without adaptive implementation would have a less-than-significant impact on the agricultural resources in the plan area. LSJR Alternatives 2, 3, and 4 would have a less-than-significant impact on the agricultural resources in the extended plan area. Under the SDWQ alternatives, water quality within the southern Delta would generally remain the same as baseline conditions such that even salt-sensitive crops would not be considered significantly affected. As such, SDWQ Alternatives 2 and 3 would have a less-than-significant impact on agricultural resources.

The impacts considered in Chapter 11 are as follows.

- Impact AG-1: Potentially convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Important Farmland) to nonagricultural use
- Impact AG-2: Involve other changes in the existing environment which, due to their location or nature, could result in a conversion of farmland to nonagricultural use
- Impact AG-3: Conflict with existing zoning for agricultural use or a Williamson Act contract
- Impact AG-4: Conflict with any applicable land use plan, policy, or regulation related to agriculture of an agency with jurisdiction over a project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect

In general, the LSJR alternatives would increase flows and decrease reservoir levels, which would reduce the amount of surface water available for irrigation districts in the plan area to supply to agricultural acreage. A reduction in surface water for irrigation could lead to the potential conversion of Important Farmland to nonagricultural uses. As discussed in Chapter 11, there are many factors affecting whether or not farmland is ultimately converted to nonagricultural uses, particularly whether or not it is urbanized, but it is reasonable to assume that a portion of the

Important Farmland losing irrigation could be converted to nonagricultural uses. The LSJR alternatives do not require land purchases, grading, or construction of buildings or infrastructure. Therefore, the LSJR alternatives do not require conditional use permits; make zoning changes; cancel or rescind Williamson Act contracts; update general plans; or make changes to agricultural land use plans, policies, or regulations that could affect agricultural resources.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on agricultural resources through the following mechanisms.

- Urbanization of agricultural land or otherwise remove it from agricultural use.
- Reduction or limitation of the availability of surface water or groundwater for irrigation in the plan area such that agricultural land is potentially removed from agricultural use.
- Changes in the water quality of existing irrigation water supplies in the plan area such that agricultural land is potentially removed from agricultural use.

The geographic scope of this cumulative analysis focuses on projects within the irrigated agricultural acreage in the LSJR and SDWQ areas of potential effects as defined in Chapter 11, Agricultural Resources. There are more than 1 million acres of agricultural lands in California's San Joaquin Valley, which includes 527,793 acres of Important Farmland (65 percent of the agricultural acreage) in the LSJR area of potential effects, and 111,532 acres of Important Farmland (76 percent of the agricultural acreage) in the southern Delta. Important Farmland that is either Prime Farmland or Farmland of Statewide Significance is designated as such because of certain positive qualities, such as good soil characteristics like drainage, and the availability, amount, and frequency of irrigation. To maintain this status these lands must be irrigated 8 out of every 10 years and there must be adequate depth to the water table to support commonly cultivated crops..

Urban expansion, including infrastructure, habitat restoration efforts, and regional planning efforts that prioritize the implementation of water supply projects and other construction, could result in the removal of land from agricultural use in the plan area, including Important Farmland. Projects, described in Table 17-1, that would urbanize agricultural land or could otherwise remove it from agricultural use in the plan area, include the following.

- Urban growth in San Joaquin, Stanislaus, and Merced Counties (i.e., Proposed San Joaquin County 2035 General Plan, Merced County 2030 General Plan, Proposed Stanislaus County General Plan Update)
- Infrastructure projects (i.e.,., California High Speed Rail Project)
- Habitat restoration projects (i.e., Dos Rios Ranch and California EcoRestore)
- Regional planning efforts (i.e., DSC Delta Plan)

The San Joaquin Valley is one of the fastest-growing areas in California. For example, San Joaquin County converted 15,924 acres of Important Farmland to urban uses between 2000 and 2010 and estimates that an additional 12,133 acres of county land currently in agricultural/open space uses would be designated for nonagricultural/open space uses by 2035, mostly around existing urban centers, including 5,968 acres of Important Farmland. In Stanislaus County, between 2010 and 2012, urban and built-up land increased 293 acres and agricultural land decreased by 893 acres overall. However, Stanislaus County restricts growth under Measure E, passed in November 2007, which requires that land designated as agricultural or open space in the Land Use Element of the proposed *Stanislaus County General Plan* cannot be amended to residential or rezoned to residential without

the approval of a majority of county voters. Measure E will remain in effect until December 31, 2036, unless it is otherwise amended by a future voter initiative. Merced County predicts that future growth resulting from implementation of its *Merced County 2030 General Plan* would result in both direct and indirect conversion of Important Farmland to urban or nonagricultural uses such as energy facilities, surface mining, the construction of infrastructure, and scattered rural residences. For example, total buildout of urban land uses designated in the *Merced County 2030 General Plan* could result in the new development of 14,683 acres by 2030.

Infrastructure and transportation projects, including roads and rail, could contribute to the conversion of Important Farmland. Transportation projects could be built upon Important Farmland and may also spur growth by creating new transportation hubs. For example, the California High Speed Rail Project calls for a high-speed rail system to be built and operated by 2029 with links between San Francisco and Los Angeles, as well as Sacramento and San Diego. The system would cover 800 miles with up to 24 stations, including several in the planned segment that traverses the LSJR area of potential effects. The project estimates that, for all statewide segments, a total of between 2,445 and 3,860 acres of farmland could be needed for railroad rights-of-way. New corridor alignments could also have the potential impact of severing existing parcels of farmland, potentially causing some to be converted to nonagricultural uses. Although the project connects existing urban areas, like many infrastructure projects, it may encourage some urbanization in currently undeveloped areas near project facilities.

Although habitat restoration projects maintain the open-space character of land, river and floodplain restoration efforts may require agricultural land along river corridors to be converted to nonagricultural uses, including to provide room for construction activities or for additional riparian habitat to complete the restoration projects. These changes could be permanent or temporary, and some of the land removed may be classified as Important Farmland. Examples of habitat restoration include Dos Rios Ranch and California EcoRestore. Dos Rios Ranch would restore land to provide wildlife habitat and flood control in the Central Valley on 1,600 acres of biologically rich floodplain, including 3 miles of riverfront on the SJR and 3 miles on the Tuolumne River. The plan area includes 119 acres of former agricultural land that was prone to flooding and planted in tomatoes, corn, alfalfa, and mixed row crops. California EcoRestore would help coordinate and advance at least 30,000 acres of critical habitat restoration in the Sacramento–San Joaquin Delta, mostly in the northern and central Delta, although some could occur in the southern Delta. Approximately 25,000 acres of the planned EcoRestore habitat is already required by the NMFS BO discussed in greater detail below. Another 5,000 acres are potential enhancements over and above the restoration required by the BOs. While some restored lands could remain in agricultural use, a significant portion is likely to be converted to nonagricultural use, including some lands that are Important Farmland.

Like general plans, regional plans do not direct construction of specific projects but may encourage certain types of activities and where they should be located. For example, the DSC was charged with developing and implementing a legally enforceable, long-term comprehensive management plan for the Delta. The Delta Plan must be designed to achieve the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem while protecting and enhancing the unique cultural, recreational, natural resource and agricultural values of the Delta as an evolving place. As mentioned previously, the Delta Plan would not directly result in regulatory approvals, actions, or other projects, but could result in other agencies or entities taking future actions; however, the Delta Plan does encourage water supply reliability, habitat restoration, and other types of projects that could convert agricultural land to nonagricultural use.

On June 23, 2016, a Sacramento Superior Court judge issued a ruling setting aside the Delta Plan because parts of it were not consistent with the Delta Reform Act and ordering the DSC to revise the Delta Plan. However, any revised Delta Plan will continue to encourage water supply reliability and habitat restoration to fulfill the statutory mandates of the Delta Reform Act.

Development in the plan area, including residential, commercial, and industrial growth, is subject to local land use policies for agricultural mitigation that are designed to compensate for the premature and unnecessary conversion of agricultural land to urban uses, discourage noncontiguous urban development patterns, and promote the conservation, preservation, and continued existence of open space lands. These policies can include agricultural mitigation fees and agricultural conservation easement requirements based on acres of land converted. However, conversions of agricultural lands due to urban and rural development, including infrastructure, are still considered significant and unavoidable after mitigation (Merced County 2013; San Joaquin County 2014). The Delta Plan adopts policies that encourage certain types of projects including, but not limited to: potential surface water and groundwater storage facilities; water intakes; conveyance facilities (canals, pipelines, tunnels, siphons, and pumping plants); groundwater wells; water transfers; hydroelectric generation; ecosystem restoration; and development that could potentially affect agricultural resources. The DSC environmental review for the Delta Plan states that temporary project impacts on agricultural resources are likely to be fully mitigated. For projects that will result in the permanent conversion of agricultural land, depending on the nature of the conversion and the characteristics of the farmland to be converted, mitigation such as agricultural conservation easements, or contributing funds to a land trust or other entity qualified to preserve farmland in perpetuity, may be feasible. Nevertheless, the Delta Plan environmental review concludes that there will be permanent impacts on agricultural resources that are significant (Delta Stewardship Council 2013).

The High Speed Rail Project includes mitigation strategies to avoid or reduce impacts on agricultural land by sharing existing rail rights-of-way to the maximum extent possible, avoiding alignment options in established farmlands, and considering farmland preservation strategies. However, the High Speed Rail Project concludes impacts on farmland are still considered potentially significant and unavoidable, even after mitigation (California High-Speed Rail Authority and USDOT Federal Railroad Administration 2012).

Habitat projects retain land in open space use and do not destroy the chemical and biological integrity of soils; therefore, the differences between agricultural uses and habitat uses are largely economic and not environmental. Nevertheless, while many habitat projects, like EcoRestore, strive to adopt strategies (e.g., restoring degraded habitat as a priority before converting agricultural land or focusing habitat restoration efforts on developing new habitat on public lands before converting agricultural lands) in order to minimize impacts on agriculture, it is likely that agricultural land will still be converted (USBR et al. 2013).

The LSJR alternatives would allocate more water for instream flow requirements, as compared to baseline, which would reduce the amount of surface water available for irrigation districts in the plan area to supply to agricultural acreage, which could lead to the potential conversion of Important Farmland to nonagricultural uses. As discussed in Chapter 11, Section 11.4.3, *Impacts and Mitigation Measures*, while a reduction in water supply availability for agricultural purposes could potentially lead to a reduction in crop acreage and a potential conversion of Important Farmland to nonagricultural use, it is not a linear relationship. Non-irrigated lands could continue to be used for agricultural use through dry land farming, fallowing, grazing, dairy, and animal husbandry practices,

and agricultural producers could mitigate reduced water availability for consumptive use by increasing irrigation efficiency, which would allow the amount of water currently applied to serve more acres. However, the State Water Board has limited authority to impose agricultural mitigation measures, and irrigation efficiencies and cropping decision would be the decisions of local farmers and local irrigation districts. While reducing flows could reduce the impacts of the LSJR alternatives, such a reduction would directly contradict the purpose of the LSJR alternatives. Thus, the incremental contribution of LSJR Alternative 2 with adaptive implementation or LSJR Alternatives 3 or 4, with or without adaptive implementation would be cumulatively considerable when viewed in connection with the effects of past, present, and future projects discussed above that could urbanize agricultural land or could otherwise remove it from agricultural use. There are no other feasible mitigation measures beyond what is proposed in Section 11.4.3, *Impacts and Mitigation Measures*, to reduce this cumulative impact to less-than-significant levels. As such, cumulative impacts related to agricultural resources in the plan area are significant and unavoidable.

The impacts of SDWQ Alternatives 2 or 3 on agricultural resources in the southern Delta are considered to be less than significant because water quality would not be degraded such that agricultural uses would be affected. Furthermore, these alternatives are meant to protect agricultural beneficial uses in the southern Delta. Therefore, the incremental contribution of SDWQ Alternatives 2 or 3 would not be cumulatively considerable, and cumulative impacts would not be significant.

Projects, described in Table 17-1, that could change water availability in the LSJR area of potential effects and potentially reduce irrigation to Important Farmland, thus increasing the likelihood that it could be converted to nonagricultural uses, include the following.

- Groundwater recharge projects
- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of the Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- Habitat restoration projects
- MRWTP Phase Two Expansion Project
- SGMA
- Water transfers

Groundwater recharge projects could take water that would otherwise remain in the Stanislaus, Tuolumne, and Merced Rivers and divert it to spreading basins that allow it to percolate into the ground or could capture it for direct injection into the groundwater aquifer. Water transfers from the three eastside tributaries could involve changes in the timing and flow of water as water is transferred between entities within the plan area, from outside the plan area to users within the plan area, or from entities within the plan area to users outside the plan area. FERC hydropower relicensing could require project-specific operational and infrastructure changes that could affect the timing and availability of water for irrigation. Habitat restoration projects could also divert surface water from the three eastside tributaries to restore and support natural habitat. The MRWTP would double the capacity of Modesto Irrigation District's (MID) water treatment plant allowing the City of Modesto to receive more water from MID for domestic use. SGMA requires sustainable management of the groundwater basins in the plan area by locally-created groundwater sustainability agencies (GSAs) that must adopt and implement groundwater sustainability plans

(GSPs) by 2020, if the basin is currently in chronic overdraft, or by 2022 for all other basins. GSPs utilize a 50-year planning horizon but must meet 5-year milestones and achieve sustainability within 20 years.

If a groundwater recharge project diverted water supply that was to otherwise be used for irrigation, there could be reductions in the number of irrigated acres, including acres of Important Farmland, which could lead to conversions to nonagricultural uses. Water transfers from the three eastside tributaries could reduce the availability of irrigation water availability and lead to reductions in irrigated acres, including acres of Important Farmland, which could lead to conversions to nonagricultural uses. In addition, farmers themselves may choose to fallow or idle their agricultural land in order to transfer water. Land that is temporarily fallowed is still considered to be in agricultural use. However, if land were permanently fallowed, that could be a direct conversion to nonagricultural uses. The FERC relicensing of the Don Pedro Hydroelectric Project, the Merced River Hydroelectric Project, and the Merced Falls Hydroelectric Project were considered in the effects analysis for the LSJR alternatives, including a wide range of potential flow releases. As such, these projects are expected to have effects similar to those identified for the LSJR alternatives, and the cumulative effects on agricultural resources are not expected to be significantly different from the analysis in Chapter 11. However, because other agencies have mandatory conditioning authority, and there may be project-specific operational and infrastructure changes required under these FERC projects, there may be localized changes in water availability in the Tuolumne and Merced Rivers resulting principally from re-operation of the reservoirs. If the water supply is reduced, there could be reductions in the number of acres that can be irrigated, which could lead to conversions of agricultural land, including Important Farmland, to nonagricultural uses. Habitat restoration projects could divert surface water from the three eastside tributaries, which could reduce surface water availability for agricultural uses. With reduced water supply, there could be reductions in the number of acres that can be irrigated. With irrigation reductions, there could be conversions, including conversions of Important Farmland, to nonagricultural uses. The MRWTP could transfer water from MID to the City of Modesto, which could reduce water availability for agricultural uses, which could in turn reduce the number of acres that can be irrigated and, therefore, potentially result in conversion to nonagricultural uses. Finally, SGMA requires sustainable groundwater management which, in the near term, could result in limits on groundwater supply for irrigation water. Historically, groundwater has been used for both direct irrigation and for surface water replacement, especially under drought conditions when surface water supplies are low. A reduced groundwater supply could result in a reduced number of acres that can be irrigated and could result in the conversion of agricultural land, including Important Farmland, to nonagricultural uses.

LSJR Alternatives 2 with adaptive implementation or LSJR Alternatives 3 and 4 with or without adaptive implementation would allocate more water for instream flow requirements, which would reduce the amount of surface water available for irrigations districts in the plan area to supply to agricultural acreage, which could lead to the potential conversion of Important Farmland to nonagricultural use. These impacts are considered cumulatively significant when considered in combination with past, present, and future projects described above that could reduce the water supply available for agricultural use, which could in turn lead to the conversion of agricultural land, including Important Farmland, to nonagricultural uses. There are no other feasible mitigation measures beyond what is proposed in Section 11.4.3, *Impacts and Mitigation Measures*, to reduce this cumulative impact to less-than-significant levels. As such, cumulative impacts would remain significant and unavoidable.

No reduction of agricultural acreage is likely under SDWQ Alternatives 2 and 3 because water quality within the southern Delta is expected to remain within the historic range. Under the program of implementation, the USBR would still be responsible for complying with the existing Vernalis salinity requirements established in the 2006 Bay-Delta Plan. Accordingly, the SDWQ alternatives would not degrade salinity conditions such that agricultural resources would be significantly affected. Projects, described in Table 17-1, that could cause changes in the water quality of existing irrigation water supplies in the plan area such that agricultural land is potentially removed from agricultural use include the following.

- California WaterFix
- NMFS BO (Chinook salmon, steelhead, sturgeon, and southern resident killer whales)
- USFWS BO (delta smelt)
- Update to the 2006 Bay-Delta Water Plan, Phase II
- Water transfers

The BOs are meant to protect fish listed under ESA from being jeopardized by the adverse effects of SWP and CVP export water operations by, at times, requiring reservoir releases, pumping reductions and other actions. Increased salinity concentrations could reduce crop yield or cause some crops to be removed from production. California WaterFix proposes new SWP Delta facilities, including three new screened intakes in the northern Delta, that could be operated at least partially in lieu of existing SWP and CVP southern Delta pumping. While California WaterFix could reduce entrainment and impingement of estuarine species in the southern Delta from existing SWP and CVP operations, it could also change south Delta water circulation and salinity by reducing the amount of Sacramento River water drawn into the southern Delta, thereby increasing salinity in the southern Delta. Transfers of water from the three eastside tributaries and SJR upstream of Merced could change the magnitude and timing of flows in the SJR and southern Delta. For example, WWCPs, such as the pending WWCP for the City of Turlock, could result in decreased flows in the LSJR during already low flow periods. Additionally, the update to the 2006 Bay-Delta Water Plan, Phase II could require greater Delta inflows, greater Delta outflows, or both. This could change southern Delta water circulation and salinity levels for agricultural resources.

The operations of the SWP and CVP are conditioned to meet the criteria in the Bay-Delta Plan and would continue to be conditioned to meet any updates to the Bay-Delta Plan, including through future State Water Board water right actions. As new points of diversion for the SWP, California WaterFix must seek permits from the State Water Board. Such permits would be conditioned to ensure that water for agricultural beneficial uses are protected consistent with Bay-Delta Plan requirements. Water transfers could change flow patterns, which could affect salinity concentrations in the southern Delta. Transfers that must pass through the Delta would generally improve south Delta salinity by increasing river water levels and inflow into the Delta and export pumping of transferred water would be subject to State Water Board conditions, including Bay-Delta Plan objectives for agricultural beneficial uses. Finally, the update to the 2006 Bay-Delta Plan, Phase II, must reasonably protect agricultural beneficial uses. Therefore, the range of salinity levels and circulation patterns in the southern Delta are not expected to be substantially different from those analyzed in Chapter 11. Consequently, past, present, and reasonably foreseeable probable future projects would not change the water quality of existing irrigation water supplies in the plan area such that agricultural land is potentially removed from agricultural use.

Considering the above limitations to adverse changes to water quality that could affect agriculture, LSJR Alternatives 2, 3, and 4 with or without adaptive implementation and SDWQ Alternatives 2 and 3 would not result in a cumulatively considerable incremental contribution to significant cumulative impacts related to changes in the water quality of existing irrigation water supplies such that agricultural land is potentially removed from agricultural use.

As discussed in Chapter 11, there are limited agricultural resources in the extended plan area and no designated Prime, Unique, or Farmland of Statewide Importance. Any effects on agricultural resources that result from reduced water supply would be similar to that described for the plan area but much smaller in magnitude and extent given the limited agricultural resources in the extended plan area. As discussed in Chapter 5, *Surface Hydrology and Water Quality*, projects in the extended plan area upstream of the rim dams would have very small effects on flows downstream of the rim dams and would not change surface water or groundwater availability for the irrigation districts. The past, present, and reasonably foreseeable future projects identified on Table 17-1 do not have the potential to affect agricultural resources in the extended plan area because they are not expected to convert designated agricultural uses to non-agricultural uses in the extended plan area. As such, the LSJR alternatives' incremental contribution to cumulative impacts related to agricultural resources in the extended plan area would not be cumulatively considerable when viewed in connection with the effects of other past, present, and probable future projects and would not result in a significant cumulative impact.

Cultural Resources

As stated in Chapter 12, *Cultural Resources*, LSJR Alternatives 2, 3, and 4 would have a less-than-significant impact on the cultural resources in the plan area and extended plan area. Under the SDWQ alternatives, salinity would generally remain the same as baseline conditions such that the baseline water quality conditions would not change. As such, SDWQ Alternatives 2 and 3 would have no impacts on cultural resources in the southern Delta and, therefore, are not considered further in this section.

The impacts considered in Chapter 12 are as follows.

- Impact CUL-1: Cause a substantial adverse change in the significance of a historical or archaeological resource
- Impact CUL-2: Disturb any human remains, including those interred outside formal cemeteries
- Impact CUL-3: Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature

In general, the LSJR alternatives would change the rates of flow of the three eastside tributaries and the LSJR, the maximum and minimum surface elevations of the three reservoirs, and the timing these surface water elevation, which could affect cultural resources. Other projects in the plan area that are considered in this cumulative impact assessment have the potential to result in changes in river flows and changes in reservoir water surface elevations. As discussed in Chapter 12, changes in flow upstream of the rim dams would be small and would not change flows downstream of the rim dams or in the southern Delta. Therefore, projects in the extended plan area would not impact on cultural resources in the plan area.

Projects could result in a cumulative effect on cultural resources if they cause a substantial adverse change in the significance of a historical or archaeological resource (Impact CUL-1); disturb any

human remains, including those interred outside formal cemeteries (Impact CUL-2); or directly or indirectly destroy a unique paleontological resource or site or unique geologic feature (Impact CUL-3) within the fluctuation zones of the reservoirs and along the rivers. Accordingly, the geographic scope of this cumulative analysis focuses on projects within the areas of fluctuation in surface water elevation around the channels of the three eastside tributaries and the LSJR and the reservoirs within the plan area and the extended plan area that have the potential for significant known and unknown cultural resources.

Past and present cumulative projects that have contributed to cultural resource impacts are discussed in more detail in the environmental setting section of Chapter 12. These projects include ground-disturbing construction activities that have resulted in the disturbance of archaeological resources and demolition of built environment resources. Development for agricultural, transportation, mining, or urban purposes has resulted in the conversion of raw land and the associated disturbance of archaeological resources, buried human remains and fossils, and, in some cases, demolition of existing built environment structures and residences.

In general, reasonably foreseeable probable future actions that could cumulatively affect cultural resources include FERC relicensing projects and restoration programs. These projects may increase exposure or inundation of the resource through re-operation of reservoirs and associated downstream flows in areas with the potential for significant known and unknown cultural resources to exist. The projects, described in Table 17-1, may have effects on cultural resources through the following mechanisms.

- Changes in the rates of flow of the three eastside tributaries and the LSJR.
- Alteration of the maximum and minimum surface elevations in the three reservoirs.
- Alteration of the timing that fluctuations in surface water elevations occur in the three reservoirs.

Projects, described in Table 17-1, that could result in changes through any of the three mechanisms stated above include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of the Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- NMFS BO (for salmon)

These and similar projects could result in the re-operation of the reservoirs, which could lead to a change in the amount and timing of water surface elevation fluctuations in the reservoirs and a change in the rates of flows downstream of the reservoirs. While the FERC projects would include the flows associated with the LSJR alternatives and any other flow adopted by FERC, the projects could result in project-specific operational and infrastructure changes and re-operation of the reservoir that could result in localized changes to reservoir elevations. Similarly, the NMFW biological opinion identified actions included the implementation of a year-round minimum flow regime in the Stanislaus River, which has the potential to change reservoir storage levels in New Melones Reservoir on the Stanislaus River.

Significant known and unknown cultural resources along the river channel margins within the fluctuation zones of the reservoirs could be affected by increased exposure or inundation. However, given previous natural and anthropogenic disturbances, and that the expected changes from the

LSJR alternatives and these projects are within historical fluctuations, there is a low potential for undocumented cultural resources to exist along the rivers or within the fluctuation zone of the reservoir.

There is generally a high potential for currently known and unknown significant historic or archaeological resources (Impact CUL-1) to exist at the three reservoirs. Under the LSJR alternatives, the historic or archaeological resources in the fluctuation zones of the reservoirs could experience variation in their physical environment due to changes in water level or siltation. However, these variations have an extremely low potential to cause a substantial adverse change in the characteristics that convey the historical significance of the resource. In addition, any significant historical and archaeological resources are protected and managed under the Historic Properties Management Plans (HPMPs) as part of the FERC hydropower water quality certifications for the Don Pedro Hydroelectric Project (FERC Project No. 2299) on the Tuolumne River and the Merced River Hydroelectric Project (FERC Project No. 2179), including Lake McClure, and by the resource management plan (RMP) administered by USBR at New Melones Reservoir on the Stanislaus River. These management plans would include standard unanticipated discovery and treatment measures should any previously unknown significant or potentially significant cultural resources be discovered during continued operation of the reservoirs.

There is a low potential for significant unknown historic or archaeological resources (Impact CUL-1) to be located within and adjacent to the three eastside tributaries and LSJR due to past anthropogenic and natural modifications within and adjacent to the river channels. Under the LSJR alternatives, average and seasonal flows are expected to remain within the existing channels that have been previously disturbed by natural flows and anthropogenic activities.

The potential for human remains (Impact CUL-2) to exist within the fluctuation zone of the reservoirs is low. Under LSJR alternatives, there would be a low potential for a change in reservoir elevation to disturb documented or currently undocumented human remains. In addition, documented or currently undocumented sites with human remains would be protected under federal and state laws and under the HPMPs prepared as part of the FERC hydropower water quality certifications for the Don Pedro Hydroelectric Project (FERC Project No. 2299) on the Tuolumne River and the Merced River Hydroelectric Project (FERC Project No. 2179), including Lake McClure, and by the RMP administered by USBR at New Melones Reservoir. Similarly, the potential for the presence of undocumented human remains within and adjacent to the three eastside tributaries and LSJR is considered low due to prior disturbance of the riparian corridors by natural and historic-era anthropogenic processes.

The potential for undocumented paleontological resources (Impact CUL-3) to be contained within the rock units in proximity to the reservoirs is low. Additionally, documented remains would be protected and managed under the existing cave management plans. Along the channel margins of the three eastside tributaries, any buried paleontological resources would be found at soil and rock depths too deep to be affected by changes in the rates of flow.

The incremental contribution of LSJR Alternatives 2, 3 and 4 with or without adaptive implementation to cultural resource impacts would not be significant when considered in combination with the impacts from the FERC relicensing projects and the BOs discussed above. Given the previous natural and anthropogenic disturbances and the fact that expected changes from the LSJR alternatives and these projects are within historical fluctuations, significant cumulative changes in cultural resources are unlikely. Moreover, cultural resources are protected and managed

under the HPMPs for the Don Pedro and Merced Hydroelectric Projects and under the RMP for the New Melones Reservoir. Therefore, the LSJR alternatives would not result in significant cumulative impacts related to cultural resources.

Similar to the discussion in the plan area, there is a low potential for cultural resources to be disturbed in the extended plan area because either there is a low potential for them to exist due to previous anthropogenic disturbances or natural and continual hydrologic disturbances (e.g., floods), or the changes that occurred under baseline have previously affected cultural resources at reservoirs and, thus, conditions under the LSJR alternatives would be unlikely to result in impacts. Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on cultural resources in the extended plan area if they disturb areas beyond that of existing reservoirs, result in elevation changes beyond the historical variation of drawdown levels at reservoirs, or result in changes beyond existing river channels. Projects, described in Table 17-1, that may result in these types of impacts include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of Lyons Reservoir
- TUD Phoenix Lake Preservation and Restoration project

All of these projects would result in potential disturbances at existing reservoirs, and it is expected that all of the projects, with the exception of the Phoenix Lake Preservation and Restoration Project, would occur within the design capacity of the existing reservoir. This means the reservoirs would continue to operate within the bounds of the design capacity constraints and within historical elevation variation. The Phoenix Lake Preservation and Restoration Project would construct a sediment bay, increase capacity, and would involve dredging. These activities have the potential to uncover unknown cultural resources that may not have been exposed during normal operations of this particular reservoir. Depending if cultural resources are uncovered and what they might be, this could be a significant impact. However, if the impact were to occur, it would be localized to this particular reservoir and would not contribute to an overall significant cumulative impact to cultural resources in the extended plan area. The LSJR alternative's incremental contribution to cumulative impacts related to cultural resources in the extended plan area would not be cumulatively considerable when viewed in connection with the effects of other past, present, and probable future projects.

Service Providers

As stated in Chapter 13, *Service Providers*, under the LSJR alternatives, surface water diversions would be reduced in both the plan area and the extended plan area. Table 17-2 summarizes the service provider impact determinations for each alternative in the plan area and the extended plan area. LSJR Alternative 2 without adaptive implementation would have less-than-significant impacts for Impacts SP-1, SP-2a, SP-2b, and SP-3. LSJR Alternative 2, with adaptive implementation, and LSJR Alternatives 3 and 4, with or without adaptive implementation, would have less-than-significant impacts for Impacts SP-2a and SP-3. LSJR Alternative 2, with adaptive implementation, and LSJR Alternatives 3 and 4, with or without adaptive implementation, would have significant and unavoidable impacts for Impacts SP-1 and SP-2b. SDWQ Alternative 2 would have a significant and unavoidable impact for Impact SP-1 and a less than a significant impact for Impact SP-2a. SDWQ Alternative 3 would have a less-than-significant impact for both Impacts SP-1 and SP-2a. SDWQ

Alternatives 2 and 3 are not relevant to Impacts SP-2b and SP-3 and, thus, have no cumulative impact. Therefore, they are not discussed further in this section.

The impacts considered in Chapter 13 are as follows.

- Impact SP-1: Require or result in the construction of new water supply facilities or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects
- Impact SP-2a: Violate any water quality standards such that drinking water quality from public water systems would be affected
- Impact SP-2b: Violate any water quality standards such that drinking water quality from domestic wells would be affected
- Impact SP-3: Result in substantial changes to SJR inflows to the Delta such that insufficient water supplies would be available to service providers relying on CVP/SWP exports

Table 17-2. Summary of Chapter 13, *Service Providers*, Impact Determinations for LSJR and SDWQ Alternatives

		LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
SP-1	Without AI	L	S	S	S (N)	L (N)
	With AI	S	S	S	N	N
SP-2a	Without AI	L	L	L	L (N)	L (N)
	With AI	L	L	L	N	N
SP-2b	Without AI	L	S (L)	S (L)	N	N
	With AI	S (L)	S (L)	S (L)	N	N
SP-3	Without AI	L	L	L	N	N
	With AI	L	L	L	N	N

Notes:
The impact determinations for SP-2b under LSJR Alternatives 2, without adaptive implementation, and LSJR Alternatives 3 and 4 in the extended plan area are different from those in the plan area.
The parentheses () denote the determination for the extended plan area.
AI = adaptive implementation (as described in Chapter 3, *Alternatives Description*).
S = significant and unavoidable impact
L = less-than-significant impact
N = no impact or not applicable

The geographic scope of this cumulative analysis focuses on projects within the plan area, the Eastern San Joaquin, Modesto, Turlock, and Extended Merced[4] Subbasins, other areas outside the plan area where there are service providers that are affected by the project and the extended plan area because these are the areas where impacts could occur.

As discussed in Chapter 5, *Surface Hydrology and Water Quality*, changes in flow upstream of the rim dams would be minimal and would not change flows downstream of the rim dams or in the southern Delta. Therefore, under LSJR Alternative 2 without adaptive implementation and LSJR Alternatives 3 and 4, for Impacts SP-1, SP-2a, and SP-3, there would be similar impacts on service providers in the plan area and extended plan area. However, under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4, impacts for Impact SP-2b in the extended plan area would be less

than significant, which is different from the plan area (where the impact for Impact SP-2b is significant and unavoidable). As discussed in Chapter 13, there were 55 service providers identified in the extended plan area. These service providers are geographically removed from the southern Delta and, thus, will not be affected by the SDWQ alternatives. Therefore, SDWQ alternatives, as they relate to the extended plan area, are not discussed further in this section.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on service providers through the following mechanisms.

- Reduction of surface water availability in the three eastside tributaries substantially, such that service providers would need to construct new or expanded existing water supply or wastewater treatment facilities to compensate for the reduction, the construction of which could result in significant environmental effects.
- Increase in groundwater pumping to compensate for reduced surface water availability such that groundwater resources are substantially depleted and groundwater levels are lowered.
- Degradation of water quality such that water quality from public water systems and domestic (i.e., private) wells violate drinking water standards.
- Reduction of SJR inflows to the Delta such that water supplies would be insufficient to service providers relying on CVP/SWP exports.

Projects, described in Table 17-1, that could change through any of the four mechanisms stated above, include the following.

- California High Speed Rail Project
- California WaterFix
- CV-SALTS and Central Valley-Wide SNMP
- Merced County's AMP for Development of Castle Airport
- Proposed San Joaquin 2035 General Plan
- Proposed Stanislaus County General Plan Update
- UC Merced 2020 Project
- Update to the 2006 Bay-Delta Water Plan, Phase II

Development projects, such as the California High Speed Rail Project, development of Castle Airport and, the UC Merced 2020 Project, would increase water demand in the region where the development takes place. Service providers are planning for and have identified future water sources for municipal and agricultural uses. However, these projects could place pressure on the existing capacity of the service providers such that suppliers respond by constructing new water supply facilities or wastewater treatment facilities, or expanding existing facilities, the construction of which could cause environmental impacts. Furthermore, increased water demand may result in more groundwater being pumped, leading to depletion of groundwater resources. The draft EIRs for the proposed general plan updates for San Joaquin and Stanislaus Counties state that there will be significant impacts associated with the construction of new water supply or treatment facilities or expansion of existing facilities to meet water demands associated with buildout under these plans.

California WaterFix, CV-SALTS and SNMP, and the update to the 2006 Bay-Delta Plan, Phase II could alter the hydrodynamics in the southern Delta which could affect salinity. Although there may be

occasions in which salinity would be increased, overall degradation of water quality is not expected in the southern Delta. In general, these projects are designed to maintain or improve water quality in the three eastside tributaries, the LSJR, and the southern Delta. For example, California WaterFix could lead to reductions in export salinity, and with additional export capacity, project water could be released to the SJR during low flow periods, which could improve water quality.

In general, under the LSJR alternatives with or without adaptive implementation, salinity in the southern Delta is not expected to differ much from baseline salinity and, overall, would decrease on average. Therefore, surface water quality is not expected to degrade such that drinking water standards would be violated in the southern Delta. Thus, the incremental contribution of the LSJR alternatives to cumulative impacts on drinking water quality (Impact SP-2a) in the SJR at Vernalis would not be cumulatively considerable since overall salinity would decrease under the LSJR alternatives with or without adaptive implementation, and cumulative impacts would be less than significant.

Sufficient surface water supplies are expected under LSJR Alternative 2 such that additional water supply or wastewater treatment facilities would not be required. Thus, the incremental contribution of the alternative to cumulative impacts (Impact SP-1) associated with the construction of new or expanded facilities would be less than significant. However, as discussed in Chapter 13, if adaptive implementation method 1 is implemented frequently and on a long-term basis, surface water diversions would be substantially reduced on the Tuolumne and Merced Rivers. Similarly, reductions in surface water supply diversions would occur under LSJR Alternatives 3 and 4 with or without adaptive implementation on these rivers as well as on the Stanislaus River. These reductions would affect service providers that rely primarily on surface water from these rivers and those providers that rely on some surface water from these rivers (Table 13-2 of Chapter 13). Some service providers are also planning to obtain additional surface water, which could be restricted under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation. As such, these LSJR alternatives would likely result in the construction of new water supply or wastewater facilities or expansion of such facilities in the plan area, the construction of which could cause environmental effects. Similarly, service providers in the extended plan area may need to construct new water supply or wastewater treatment facilities or expand such existing facilities. The incremental contribution of LSJR Alternative 2 with adaptive implementation, or LSJR Alternatives 3 or 4 with or without adaptive implementation would be significant when considered in connection with the new or expanded water supply or wastewater treatment facilities (Impact SP-1) as a result of the projects listed above. Therefore, there would be a significant cumulative impact in both the plan area and extended plan area.

If new or expanded facilities are required as a result of reduced surface water supply, the facilities would be carried out as part of individual projects associated with the service providers and could result in potentially significant environmental impacts. As discussed in Chapter 13, Section 13.4.3, *Impacts and Mitigation Measures*, the State Water Board would not be responsible for or have discretionary authority to approve the construction of any new or modified facilities and, therefore, it is not feasible for the State Water Board to impose possible mitigation measures (listed in Chapter 16, Table 16-38). Moreover, the State Water Board lacks authority to impose mitigation measures related to impacts such as air and noise. There is no feasible mitigation the State Water Board can implement to reduce environmental impacts resulting from the need for new or modified facilities (Impact SP-1). Therefore, under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation, the impacts would remain cumulatively considerable and significant.

Furthermore, given the potential reductions in surface water supply on the Stanislaus, Tuolumne, and Merced Rivers, pumping would be expected to increase in the Extended Merced, Modesto, and Turlock Subbasins, which would experience decreases in groundwater levels under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation. The Eastern San Joaquin Subbasin would also be affected under LSJR Alternative 4. These impacts on groundwater levels could result in reductions in groundwater supply and degradation of the quality of groundwater that the service providers and domestic well owners rely on as a source of drinking water. While water quality from public water system would not be impacted significantly, water quality from domestic wells could be impacted significantly, as discussed in Chapter 13, Section 13.4.3. The new or expanded water facilities that could be constructed as a result of projects like the California High Speed Rail Project, Castle Airport, and the UC Merced 2020 Project, could include new or expanded groundwater wells that would increase the groundwater pumping capacity. As discussed previously, increased pumping could reduce groundwater levels and potentially degrade groundwater as a source of drinking water. However, the incremental contribution of LSJR Alternative 2 with adaptive implementation or LSJR Alternatives 3 or 4 with or without adaptive implementation on drinking water quality from public water systems would not be significant when viewed in connection with these and other past and present projects; this is because public water system operators are required to comply with drinking water standards and would have to take corrective actions if their drinking water wells exceed the drinking water standards. As such, there would not be a cumulative significant impact (Impact SP-2a). In contrast, the incremental contribution of LSJR Alternative 2 with adaptive implementation or LSJR Alternatives 3 or 4 with or without adaptive implementation on drinking water quality from domestic wells would be significant when viewed in connection with the additional pumping and the potential groundwater degradation that may result from these projects. Additionally, there are no mechanisms to prevent domestic wells from using groundwater that exceeds drinking water standards as domestic wells are largely unregulated. Therefore, under LSJR Alternative 2 with adaptive implementation, or LSJR Alternatives 3 or 4 with or without adaptive implementation, cumulative impacts on drinking water (Impact SP-2b) in the plan area would remain cumulatively considerable and significant.

The State Water Board does not have authority to require implementation of mitigation that could reduce these cumulative impacts to a less-than-significant level, because it does not regulate domestic wells. As discussed in Chapter 13, the State Water Board can and does assist in identifying water quality threats through the Groundwater Ambient Monitoring and Assessment (GAMA) Program, the State Water Board's comprehensive groundwater quality monitoring program for California, and GeoTracker GAMA, a publically accessible online database of groundwater water quality data in California. Using the data collected in GAMA since year 2000, the State Water Board also provides the online, map-based tool "Is My Property Near a Nitrate-Impacted Water Well?" to assist domestic well owners in evaluating the risk of their wells to nitrate contamination.

Possible mitigation measures that owners and operators of domestic wells could undertake to avoid or reduce potential drinking water impacts at domestic wells include the following.

- Have a licensed contractor construct wells in accordance with well construction standards.
- Choose a location for a well to make sure it is free of potential sources of contamination.
- Test well water at certified drinking water laboratories to ensure its quality.

- If necessary, install a water treatment system tailored to the overall water chemistry and constituents that need to be removed (e.g., activated alumina filters, activated charcoal filters, air stripping, anion exchange, and ultraviolet radiation).
- If necessary, drill a new well that taps into a cleaner aquifer or find an alternative water source.
- Properly destroy unused and abandoned wells to prevent contamination.

In addition, local agencies can and should exercise their police powers and groundwater management authority under SGMA to address groundwater contamination so as to prevent and/or mitigate drinking water impacts on domestic wells. As discussed in the *Groundwater Resources* section of this chapter, SGMA requires local agencies to sustainably manage groundwater resources or, if local agencies are unable or unwilling, authorizes the state to intervene and develop an interim plan until locals can assume, or resume, management. Sustainable groundwater management is defined under SGMA as the management and use of groundwater in a manner that can be maintained during the 50-year planning and implementation horizon without causing undesirable results, including but not limited to: chronic lowering of groundwater levels; significant and unreasonable reductions in groundwater storage; significant and unreasonable degraded water quality; and significant and unreasonable subsidence that substantially interferes with surface land uses. (Wat. Code, § 10721.) Following the adoption of groundwater sustainability plans in either 2020 or 2022 (depending on if the basin is critically overdrafted), locals will have 20 years to achieve sustainable groundwater management. Plans must include milestones that, following initial submission of the plan, will be reviewed by the state every 5 years.

Thus, at this time, local agencies are vested with the mandatory duty to achieve sustainable groundwater management, which includes preventing significant and unreasonable degradation to water quality. These agencies can and should exercise their full authorities to address degradation of groundwater quality, both under SGMA and their police powers. Doing so would prevent and/or mitigate domestic well drinking water supply impacts. However, due to the inherent uncertainty in the degree to which this mitigation and those listed above may be implemented by local agencies and owners and operators of domestic wells, under LSJR Alternative 2, with adaptive implementation, and LSJR Alternatives 3 and 4, impacts related to drinking water impacts on domestic wells (SP-2b) would remain cumulatively considerable and significant in the plan area.

In the extended plan area, under LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation, bypass flows could be required more frequently and be larger than under baseline conditions, which could result in significantly less surface water available to the 12 service providers (listed in Chapter 13, Table 13-6), who collectively divert a total of 7.61 TAF annually. Increased groundwater pumping may occur; however, the increased pumping is not likely to affect groundwater quality and, thus, drinking water from public or private wells. This is because in the extended plan area, the amount of water that may be pumped is small given the small amount of total municipal use that occurs in the extended plan area, and pumping primarily occurs in fractured rocks which produces relatively small and isolated groundwater areas such that pumping would have minimal influence on contaminant migration. The projects listed above would not affect the groundwater quality in the extended plan area. Therefore, LSJR Alternatives 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation would not result in a cumulatively considerable incremental contribution to cumulative impacts or significant cumulative impacts related to drinking water (Impacts SP-2a and SP-2b), and cumulatively adverse impacts would be less than significant in the extended plan area.

With respect to Impact SP-3, in both the plan area and the extended plan area, there would be no reduction in annual average CVP/SWP exports. Hence, SJR inflows to the Delta would not be affected under LSJR Alternatives 2, 3 and 4. The incremental effect of the LSJR alternatives, when viewed in connection with the projects like the California High Speed Rail Project, Castle Airport, UC Merced 2020 Project, and water transfers, would not be cumulatively significant, and there would be no significant cumulative impact.

Under SDWQ Alternative 2, it is expected that some of the service providers (e.g., City of Tracy) would not be able to meet effluent limitations if the effluent limitations are set by the Central Valley Water Board to match the SDWQ Alternative 2 objective (i.e., 1.0 dS/m). Therefore, it can be expected that wastewater treatment requirements set by the Central Valley Water Board may be exceeded if a variance (i.e., under Central Valley Water Board Resolution No. R5-2014-0074, which authorizes variances that delays the deadline for compliance with salinity requirements) is not granted or its coverage expires. In order to comply, potential new facilities or modifications of existing facilities would be constructed as part of individual projects associated with the service providers could result in potentially significant environmental impacts. Projects like California WaterFix; CV-SALTS and SNMP; and the update to the 2006 Bay-Delta Plan, Phase II, could improve LSJR flow and water quality in the southern Delta, but it is unlikely that these projects could reduce the salinity of the effluent from the southern Delta wastewater treatment plant to such a degree that they would comply with a 1.0 dS/m effluent limitation. The incremental cumulative contribution of SDWQ Alternative 2 to the cumulative impact on service providers would be significant when viewed in connection with the new or expanded water supply or wastewater treatment facilities (Impact SP-1) that may be constructed as a result of projects, like the California High Speed Rail Project, Castle Airport, UC Merced 2020 Project, and the LSJR alternatives would result in a significant cumulative impact. As described above, there is no feasible mitigation the State Water Board could implement to reduce environmental impacts on service providers resulting from the need for new or modified facilities. Therefore, under SDWQ Alternative 2, this impact (Impact SP-1) would remain cumulatively considerable and significant.

Under SDWQ Alternative 3, potential new facilities or modifications to existing facilities are not expected, and all service providers would be expected to comply without new or modified facilities based on annual average EC data and previous EC violations. The incremental cumulative contribution of SDWQ Alternative 3 to cumulative impacts on service providers would not be considerable, and when viewed in connection with the related past, present, and reasonably foreseeable probable future projects listed above, this alternative would not result in a significant cumulative impact. Therefore, under SDWQ Alternative 3, this impact (Impact SP-1) would not be cumulatively significant. SDWQ Alternatives 2 and 3 are expected to maintain the historical range of salinity in the southern Delta because USBR would remain responsible for complying with the current salinity standards at Vernalis under its water right permits. Substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur under SDWQ Alternatives 2 or 3. Therefore, the incremental contribution of SDWQ Alternatives 2 or 3 to cumulative impacts on drinking water quality from public water systems would not be considerable. And, when viewed in connection with relevant projects listed above, cumulative impacts (Impact SP-2a) would not be significant.

Energy and Greenhouse Gases

As stated in Chapter 14, *Energy and Greenhouse Gases*, LSJR Alternative 2 with or without adaptive implementation would have a less-than-significant impact on energy and GHGs in the plan area,

while LJSR Alternatives 3 and 4 with or without adaptive implementation would have significant and unavoidable impacts on energy and GHGs in the plan area. LSJR Alternative 2 with adaptive implementation, and LJSR Alternatives 3 and 4 with or without adaptive implementation would have significant and unavoidable impacts on energy and GHGs in the extended plan area, while LSJR Alternative 2 without adaptive implementation would have a less-than-significant impact on these energy and GHGs in the extended plan area. Under the SDWQ alternatives, salinity would generally remain the same as baseline conditions. As such, SDWQ Alternatives 2 and 3 would have no impact on energy and GHGs (Impacts EG-1 through EG-4) and, therefore, are not considered further in this section.

The impacts considered in Chapter 14 are as follows.

- Impact EG-1: Adversely affect the reliability of California's electric grid
- Impact EG-2: Result in inefficient, wasteful, and unnecessary energy consumption
- Impact EG-3: Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment
- Impact EG-4: Conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing GHG emissions
- Impact EG-5: Effect of climate change on the LSJR and SDWQ alternatives

The LSJR alternatives would not require energy consumption or generate GHG emissions directly. However, the LSJR alternatives may affect hydropower generation by requiring more water to be released instream during the February–June period, making less stored water available for release in the summer. This, in turn, could result in additional energy generation at other facilities to compensate for the loss of hydropower generation. In addition, the LSJR alternatives could result in increased energy consumption associated with increased groundwater pumping. These activities could result in increased GHG emissions.

While the LSJR alternatives may result in a loss of carbon-free hydropower generation, it is anticipated that electricity derived from existing carbon-free hydropower sources would be compensated for by ramping up other generation facilities. Additionally, while other sources to compensate for electricity would include renewable energy sources, not all renewable energy is carbon free. For example, biomass- and biofuel-derived energy does emit GHGs.

No single project is likely to generate enough GHG emissions to cause an appreciable impact on climate change by itself; rather, climate change is the result of the GHG contributions of countless past, present, and future sources. The relevant inquiry is whether a project's incremental impact is cumulatively considerable in light of the global problem. California has policies and procedures in place to reduce statewide GHG production. For example, the California Renewables Portfolio Standard (RPS) (discussed in Chapter 14, Section 14.3.2, *State [Regulatory Background]*) requires that all electricity producers increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020. Energy production and consumption in the SJR Basin and California is anticipated to result in the use of more renewable energy sources over the next few decades. This is already evident, as the SJR Basin and surrounding areas have seen an increase in renewable energy projects, which will help the state meet the RPS requirements.

Past, present, and reasonably foreseeable projects, described in Table 17-1, may have effects on energy and greenhouse gas resources through the following mechanisms.

- Adverse effects on the reliability of California's electric grid by decreasing energy production or resulting in inefficient, wasteful, and unnecessary energy consumption.
- Generation of GHG emissions, either directly or indirectly, that may have a significant impact on the environment, or conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing GHG emissions.

The geographic scope of this cumulative analysis focuses on projects within the plan area and the extended plan area.

Projects, described in Table 17-1, that could adversely affect the reliability of California's electric grid or result in inefficient, wasteful, and unnecessary energy consumption include the following.

- FERC Relicensing of the Don Pedro Hydroelectric Project (FERC Project No. 2299)
- FERC Relicensing of Merced River Hydroelectric Project (FERC Project No. 2179) and Merced Falls Hydroelectric Project (FERC No. 2467)
- FERC Relicensing of Lyons Reservoir
- NMFS BO
- TUD Phoenix Lake Preservation and Restoration project
- Water transfers

These projects could result in re-operation of reservoirs that could lead to a change in the amount and timing of reservoir releases and water surface elevation fluctuations in the reservoirs. This has the potential to change the timing of and to reduce hydropower generation from the major dams on the Stanislaus, Tuolumne, and Merced Rivers. The overall operation of these reservoirs, however, is not expected to vary beyond the bounds analyzed for the LSJR alternatives. While hydropower generation may depend on the timing and amount of the transfer, surface water transfers typically must be within the same season, and so this would serve to limit potential changes. As discussed in Chapter 14, the transmission line loadings would not exceed the limits under contingency outage conditions under the LSJR alternatives because hydropower generation and reservoir elevation would not be substantially modified.

Additional energy generation at other facilities to compensate for a potential loss of hydropower under the LSJR alternatives would not be considered inefficient, wasteful, and unnecessary as it is energy that would be generated to maintain the energy supply level that is currently supplied by hydropower. Therefore, there would be no inefficient, wasteful, or unnecessary energy consumption under LSJR Alternatives 2, 3, and 4 with or without adaptive implementation.

The FERC projects listed above would include the flows associated with the LSJR alternatives and any other flow adopted by FERC. Additionally, the operation of New Melones Reservoir and Stanislaus River flows under the NMFS BO would include the flows associated with the LSJR alternatives. The effects of these other projects on grid stability and energy consumption would fall within the range of effects analyzed for the LSJR alternatives.

GHG emissions under LSJR Alternatives 2 would not exceed the 10,000 MT CO2e threshold with and without adaptive implementation. Therefore, GHG emissions would not have a significant impact on the environment under LSJR Alternative 2. GHG emissions under LSJR Alternatives 3 and 4 would exceed the 10,000 MT CO2e threshold with and without adaptive implementation. Thus, GHG

emissions would have a significant impact on the environment under LSJR Alternatives 3 and 4 with or without adaptive implementation.

Projects, described in Table 17-1, that could generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, or conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing GHG emissions, include the following.

- California High Speed Rail Project
- DSC Delta Plan
- Merced County's Castle AMP for Development of Castle Airport
- MRWTP Phase Two Expansion Project
- UC Merced 2020 Project

Physical improvements associated with these, and similar projects, could result in an increase in GHG emissions. GHG emissions are primarily generated during construction activities due to the considerable use of heavy equipment and construction vehicle trips, which are likely to have the greatest construction GHG emissions. Additionally, operation-phase impacts could occur directly (e.g., from maintenance activities) or indirectly (e.g., from increased electricity use).

RPS requirements would serve to reduce the carbon intensity of generated electricity, thereby helping to reduce the GHG emissions that would be associated with reduced hydropower generation and the increased use of electricity for groundwater pumping under LSJR Alternatives 3 and 4 with or without adaptive implementation. However, even if 33 percent of electricity in California were to be generated using renewable resources and the total GHG emissions resulting from LSJR Alternatives 3 and 4 were reduced by 33 percent, LSJR Alternatives 3 and 4 with or without adaptive implementation would still generate more than 10,000 MT CO2e per year (thereby exceeding the threshold) and would make a cumulatively considerable incremental contribution. Thus, impacts related to the energy and GHS resource under LSJR Alternatives 3 and 4 with or without adaptive implementation would be cumulatively considerable. There are no feasible mitigation measures beyond those proposed in Chapter 14, Section 14.4.3, *Impacts and Mitigation Measures,* to reduce this cumulative impact to less-than-significant levels.

As discussed in Chapter 14, Section 14.4.4, *Impacts and Mitigation Measures: Extended Plan Area*, the LSJR alternatives could affect energy (i.e., hydropower electrical production) resources in upstream reservoirs on the Stanislaus and Tuolumne Rivers. Hydropower production effects associated with the reservoir volume reduction under LSJR Alternatives 2 and 3 without adaptive implementation would be similar to baseline conditions. However, volume reductions would occur more frequently and be more severe during drought conditions, particularly under LSJR Alternatives 3 and 4 with or without adaptive implementation, but also under LSJR Alternative 2 with adaptive implementation. Consequently there could be significant hydropower production reductions at reservoirs under LSJR Alternatives 3 and 4 with or without adaptive implementation in the extended plan area, which could result in related adverse GHG emission if hydropower is replaced with non-renewable energy sources. Considering GHG emissions are cumulatively considerable since climate change is the result of the individual GHG contributions of countless sources, LSJR Alternatives 3 and 4 with or without adaptive implementation would result in cumulatively considerable GHG impacts in the extended plan area. There are no feasible mitigation measures beyond what is in Section 14.4.4 to reduce this cumulative impact to less-than-significant levels.

Finally, as discussed above, climate change results from multiple sources. Climate change, in combination with related projects, would not significantly affect the LSJR and SDWQ alternatives (Impact EG-5) because the proposed adaptive implementation would allow agencies to respond to changing circumstances with respect to flow and water quality that might arise due to climate change. Furthermore, the required periodic review and update of WQCPs continually accounts for changing conditions related to water quality such as climate change.

17.2.3 Additional Resource Areas Considered

Resource areas were initially evaluated using Appendix B, *State Water Board's Environmental Checklist*. Resource areas that were determined to need further analysis (i.e., impacts are listed as "Potentially Significant Impacts") are evaluated in the resource chapters (Chapters 5–14) and cumulative impacts are discussed in Section 17.2.2 of this chapter. However, some resource areas were determined to have "Less-than-Significant Impacts" and, thus, are only evaluated in Appendix B. These resource areas are discussed below to assess if their incremental impacts become cumulatively considerable when considered together with the potential impacts of the projects listed in Table 17-1. If an impact does not result in part from the LSJR and SDWQ alternatives, it is not discussed.

Air Quality

As discussed in Appendix B, Section III, the LSJR alternatives would result in changes in operations at the rim dams, which could result in decreased hydropower generation. This loss in hydropower generation may necessitate increased production from other power facilities to offset the loss. Implementation of the LSJR alternatives may also result in additional groundwater pumping to replace reduced surface water diversions. This groundwater pumping is anticipated to be within irrigation service areas and could require additional electrical use. It is assumed that electric pumps will be used to power increased groundwater pumping as electric pumps are cheaper and more efficient than diesel pumps on a long-term basis. Additionally, under the LSJR alternatives, reductions in surface diversion from the three eastside tributaries could result in removal of croplands from agricultural production (Threshold III[a]). As discussed in Threshold III(c), the net effect of this removal of croplands would not increase fugitive dust emissions. Furthermore, implementation of air quality plans would not be affected (Threshold III[b]). In general, potential impacts would increase as the percentage of unimpaired flows increases (i.e., LSJR Alternative 2 would have the fewest impacts and LSJR Alternative 4 would have the greatest impacts). However, as discussed in Appendix B, Section III, the LSJR alternatives would not result in a net change in pollutant emissions, and their implementation would be consistent with air quality management plans and regulations. The LSJR alternatives would not result in a cumulatively considerable incremental effect or contribute to a significant cumulative effect on air quality. The cumulative impact is less than significant.

Geology and Soils

Impacts on geology and soils are initially discussed in Appendix B, Section VI. An analysis of subsidence is included in Chapter 9, *Groundwater Resources*, and erosion is analyzed in Chapter 6, *Flooding, Sediment, and Erosion*. Erosion impacts related to reduced irrigation of irrigated lands are not cumulatively considerable and are less than significant. As discussed in Chapter 11, *Agricultural Resources*, while some agricultural land could be taken out of irrigated agricultural use as a result of

the LSJR alternatives (particularly LSJR Alternatives 3 and 4), many of these lands could remain in agricultural use, even if they are not irrigated. Furthermore, the lands must remain in uses that are compatible with applicable local land use plans, policies or regulations. In addition, the implementation of agricultural practices to address dust control, weed abatement, and revegetation would result in an insubstantial amount of soil erosion or loss of topsoil. There would be no impacts on geology and soils specifically from implementation of the SDWQ alternatives. Any potential cumulative impacts related to subsidence and erosion caused by the LSJR alternatives are discussed in Section 17.2.2, *Cumulative Impact Analysis*, under the groundwater resources and flooding, sediment, and erosion sections, respectively. The other impact areas included in Appendix B, Section VI would not have impacts on geology and soils from implementation of the LSJR and SDWQ alternatives.

In general, potential impacts would increase as the percentage of unimpaired flows increases (i.e., LSJR Alternative 2 would have the fewest impacts and LSJR Alternative 4 would have the greatest impacts). However, other than those impacts discussed in Section 17.2.2 of this chapter, there are no cumulatively considerable impacts on geology and soils caused by the LSJR alternatives.

Recreation

Impacts on recreation resources are initially discussed in Appendix B, Section XV. Detailed analysis of recreation resources is included in Chapter 10, *Recreational Resources and Aesthetics*. As discussed in Appendix B, Section XV(b), any potential cumulative impacts related to recreation resources resulting from the LSJR alternatives are discussed in Section 17.2.2 under the *Recreation Resources and Aesthetics* section.7

However, other than those impacts discussed in Section 17.2.2 of this chapter, there are no cumulatively considerable impacts on recreation resources resulting from the LSJR alternatives.

17.2.4 Cumulative Impact Summary

In evaluating cumulative effects, the analysis in each of the resource chapters determines whether the incremental effects of the alternatives 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 (Cal. Code Regs., tit. 14, §§ 15130, 15064, 15065, 15130.) The existence of significant cumulative impacts caused by other projects alone is not necessarily substantial evidence that the alternative's incremental effects are cumulatively considerable. (Cal. Code Regs., tit. 14, § 15064.) Therefore, the cumulative impact analysis examines whether the overall cumulative impact (considering past, present, and reasonably foreseeable probable future projects) is significant and whether the alternatives make a cumulatively considerable incremental contribution to an overall cumulative impact. (Cal. Code Regs., tit. 14, §§ 15064, 15065, 15130.)

The cumulative analysis uses the impact threshold topics and significance criteria (as discussed in the cumulative impact analysis section of the relevant resource chapter) to evaluate the significance of any cumulative effects. Where appropriate, the cumulative analysis is combined for various project alternatives. The cumulative effects analysis applies to all LSJR and SDWQ alternatives. Table 17-3 summarizes the cumulative impact determinations for each resource for the plan area. Table 17-4 summarizes the differences in the cumulative impact determinations for each resource between the plan area and the extended plan area. Analysis of the cumulative effects of LSJR Alternatives 2, 3, and 4 and SDWQ Alternatives 2 and 3, with respect to each resource can be found

in Section 17.2.2, *Cumulative Impact Analysis*, of this chapter. Analysis of the cumulative effects of the No Project Alternative can be found in Chapter 15, *No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1)*.

Table 17-3. Summary of Cumulative Impacts in the Plan Area

Resource	No Project Alternative (LSJR/SDWQ Alternative 1)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Surface Hydrology and Water Quality	X	—	—	—	—	—
Flooding, Sediment, and Erosion	—	—	—	—	—	—
Aquatic Biological Resources	X	—	—	—	—	—
Terrestrial Biological Resources	X	—	—	—	—	—
Groundwater Resources	X	X	X	X	—	—
Recreational Resources and Aesthetics	X	—	X	X	—	—
Agricultural Resources	X	X	X	X	—	—
Cultural Resources	X	—	—	—	—	—
Service Providers	X	X	X	X	X	—
Energy and Greenhouse Gases ~~Climate Change~~	X	—	X	X	—	—

Notes:
Cumulative impact determinations in this table incorporate impacts both with and without adaptive implementation and reflect the most significant impact determination.
X = cumulatively significant impact.
— = no cumulatively significant impact.

Table 17-4. Summary of CEQA Significance Determinations for Cumulative Impacts in the Extended Plan Area

Resource	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4
Surface Hydrology and Water Quality	—	—	—
Flooding, Sediment, and Erosion	—	—	—
Aquatic Biological Resources	X	X	X
Terrestrial Biological Resources	X	X	X
Groundwater Resources	—	—	—
Recreational Resources and Aesthetics	X	X	X
Agricultural Resources	—	—	—
Cultural Resources	—	—	—
Service Providers	X	X	X
Energy and Greenhouse Gases ~~Climate Change~~	X	X	X

Notes:
Cumulative impact determinations in this table incorporate impacts both with and without adaptive implementation and reflect the most significant impact determination.
The No Project Alternative (LSJR/SDWQ Alternative 1) and SDWQ Alternatives 2 and 3 would have no effect in the extended plan area and, therefore, are not included in this table.
Gray shading denotes a change in the significance determination for the cumulative impacts for a resource between the plan area and extended plan area.
X = cumulatively significant impact.
— = no cumulatively significant impact.

17.3 Growth-Inducing Effects

CEQA requires a discussion of "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." (Cal. Code Regs., tit. 14, § 15126.2, subd. (d).) Growth-inducing projects include projects that have the potential to remove obstacles that inhibit population growth, or encourage and facilitate other activities that can significantly affect the environment, either individually or cumulatively. This section discusses the potential growth-inducing effects of the LSJR and SDWQ alternatives, and the No Project Alternative (LSJR/SDWQ Alternative 1).

The evaluation of potential growth-inducing impacts is qualitative and discusses the possible ways the LSJR and SDWQ alternatives could have growth-inducing effects. It also addresses whether the project alternatives would directly or indirectly foster economic, population, or housing growth; remove obstacles to growth; or encourage and facilitate activities that could significantly affect the environment, either individually or cumulatively. (Cal. Code Regs., tit. 14, § 15126.2, subd. (d).) Growth-inducing impacts are not to be construed as necessarily beneficial, detrimental, or of little significance to the environment.

The LSJR alternatives would establish new flow objectives on the LSJR and its three eastside tributaries for the purpose of protecting fish and wildlife beneficial uses. The SDWQ alternatives

would amend the southern Delta salinity objectives, as identified in the 2006 Bay-Delta Plan, for the purpose of continuing to protect agricultural beneficial use of agriculture in the southern Delta.

SDWQ Alternatives 2 and 3 generally would maintain the historical range of salinity in the southern Delta. Accordingly, implementation of the salinity objective is unlikely to result in expanded agricultural uses or the development of additional agriculture lands, and thus, the alternatives would not foster economic growth or attendant population or housing growth, or remove obstacles to growth. As discussed in Chapter 16, *Evaluation of Other Indirect and Additional Actions*, point-source dischargers (e.g., wastewater treatment plants) may take certain actions to comply with the salinity requirements imposed through water quality permits, such as developing new source water supplies; implementing salinity pretreatment programs that require commercial, institutional, or industrial facilities or residential salinity source controls; or implementing an effluent desalination process at the wastewater treatment plants before treated effluent is discharged to the southern Delta. Such activities would result from the need to achieve compliance with the salinity objective; it would be speculative to assume that such activities would provide infrastructure or increased capacity that could serve other unrelated projects, such as additional housing or industrial developments. These compliance actions would not create new sources of water or wastewater treatment facilities that would foster population, economic, or housing growth, or remove obstacles to growth. Thus, SDWQ Alternatives 2 and 3 do not have growth-inducing effects.

LSJR Alternatives 2, 3, and 4 do not have growth-inducing effects for the following reasons.

- Under the LSJR alternatives, changes in river flows would generally result in more water remaining in the three eastside tributaries rather than being used for consumptive purposes. Therefore, changes in river flows would not increase the reliable water supply and would not directly or indirectly induce economic, population, or housing growth.
- Under the LSJR alternatives, changes in river flows in the three eastside tributaries would generally result in an increase in Delta inflow. This is because additional flows would be required to remain in the tributaries, which ultimately discharge into the southern Delta from the LSJR. Within the legal Delta, water availability and quality are not limiting growth factors; numerous unrelated constraints (e.g., flooding risk and protections of agricultural lands) limit growth potential under existing conditions. Therefore, changes in river flows would not remove existing growth-limiting factors (i.e., obstacles to growth), and would not directly or indirectly induce growth.
- Under the LSJR alternatives, changes in river flows in the three eastside tributaries would generally result in slightly increased Delta outflow. To the extent that outflow is needed to meet water quality objectives (e.g., the Delta outflow objective), it is not available for appropriation. Therefore, an increase in outflow would not increase the reliable water supply and would not directly or indirectly induce growth. The potential for increases in exports is discussed below.
- The LSJR alternatives may potentially result in a reduction of surface water availability, thereby reducing the amount of surface water available for agricultural and other purposes. While this could result in land being removed from agricultural production, the location and area of such lands cannot be predicted with certainty. Therefore, the possibility that such lands would then be converted to housing or other economic uses is speculative.
- Modeling predicts a potential for minor increases in exports under the LSJR alternatives, on an average annual basis. Average annual increases in Delta exports under LSJR Alternatives 2, 3, and 4 were estimated to be 18 TAF, 76 TAF, and 194 TAF, respectively. These increases are

minor because they represent only a small percentage (0.4 percent, 1 percent, and 4 percent under LSJR Alternatives 2, 3, and 4, respectively) of total Delta exports, which historically averaged 5,185 TAF per year between 1995 and 2013. Such minor increases in exports under the LSJR alternatives are not considered to be growth-inducing for the following reasons.

- Delta exports make up less than half of the water supplies available to and used in California south of the Delta and in the CVP and SWP export service areas.
- Although modeling predicts minor increases in exports on an average annual basis, the annual variability of exports is high and actual exports are controlled by a variety of factors, including: weather patterns; annual agricultural practices; economic conditions; and availability of water from other sources (e.g., groundwater, local water sources, recycled water, Colorado River supplies) south of the Delta and in the CVP and SWP export service areas. Additionally, the timing and amount of permissible exports are controlled by many other laws, regulations, permits, and water rights, only some of which are related to water availability in the Delta for export, and these requirements vary from year to year. The minor modeled increases in exports are well within the range of normal variation experienced from year to year.

The No Project Alternative (LSJR/SDWQ Alternative 1) assumes full compliance with all flow and water quality objectives in the 2006 Bay-Delta Plan as implemented through the State Water Board's Water Right Decision 1641~~D-1641~~ (revised March 15, 2000) and the NMFS BO on the Stanislaus River (which is included in the baseline). The changes in river flow and salinity level under No Project Alternative would be small as compared to baseline. For the reasons identified above regarding the potential effects of the LSJR and SDWQ alternatives on growth, implementation of the No Project Alternative would not directly or indirectly foster economic, population, or housing growth; remove obstacles to growth; or facilitate or encourage other such activities.

17.4 Significant Irreversible Environmental Changes

Section 15126.2(c) of the State CEQA Guidelines directs a discussion of the significant irreversible environmental changes that would be caused by a proposed project. Section 15127(a) of the State CEQA Guidelines requires information about irreversible changes to be included in connection with the adoption, amendment, or enactment of a plan of a public agency, such as the amendment of the 2006 Bay-Delta Plan by the State Water Board. An significant irreversible change to resources is the permanent loss or damage of resources for future or alternative purposes. Irreversible changes to resources result in resources that cannot be recovered or recycled, or those that are consumed or reduced to unrecoverable forms. They can be caused, either directly or indirectly, by the use of natural resource so that it cannot be restored or returned to their original condition.

The LSJR and SDWQ alternatives and their implementation would not directly result in the significant irreversible commitment of resources because their primary effect is to protect water quality for fish and wildlife and agricultural beneficial uses. However, certain alternatives may indirectly result in the permanent loss or damage of resources for future or alternative purposes or may use natural resources such that they cannot be restored or returned to their original condition. These are described below.

LSJR Alternative 2 with adaptive implementation and LSJR Alternatives 3 and 4 with or without adaptive implementation may have potentially significant impacts associated with groundwater,

agricultural, and energy resources, which are resources may not be recovered or recycled or may be used such they cannot be restored or returned to their original condition. Increased groundwater pumping could potentially deplete groundwater supplies and cause interference with groundwater recharge; both of which could increase the possibility of overdraft. As discussed in Chapter 9, *Groundwater Resources*, various actions, such as implementation of SGMA, groundwater recharge projects, conjunctive use, and other management projects, would benefit groundwater resources. Groundwater use could potentially be mitigated, through implementing management controls to reduce or manage pumping in groundwater subbasins; however management varies by subbasin. Additionally, given the variability of local agency response to implementing sustainable practices and the condition of the groundwater resources in the subbasins (including overdrafted and critically overdrafted groundwater basins), the LSJR alternatives could result in potentially significant irreversible environmental changes to groundwater resources. Reductions in surface water supply may result in reduced surface water availability for agricultural uses. In turn, this may result in some agricultural lands being removed from agricultural use and converted to other uses. Depending on the new use (e.g., housing or industrial uses), the change could be considered irreversible. While the location and extent of such conversion is speculative, the LSJR alternatives could result in potentially significant irreversible environmental changes to agricultural resources. The LSJR alternatives may affect hydropower generation by requiring more water to be released instream during the February–June period, making less stored water available for release in the summer. This, in turn, could result in additional energy generation at other facilities to compensate for the loss of hydropower generation, as well as hydropower generation. As discussed in Chapter 14, *Energy and Greenhouse Gases*, the other facilities could generate energy from hydropower. However, if they do not, they would likely result in the generation of energy that may not be able to be replaced and as such could result in a potentially significant irreversible environmental changes to energy resources.

To the extent that the LSJR Alternatives 2, 3, or 4 with or without adaptive implementation would result in the construction or maintenance of indirect actions or non-flow measures, this would likely result in the use of resources that may not be recovered or recycled or may be used such they cannot be restored or returned to their original condition. Depending on the scale and size of the indirect actions or non-flow measures described in Chapter 16, *Evaluation of Other Indirect and Additional Actions*, the following resources could be used such that they cannot be recovered or recycled: energy expended in the form of electricity, gasoline, diesel fuel, oil for construction equipment and transportation vehicles that would be needed; mined materials, such as sand, gravel, steel, lead, copper, or other metals as needed for the particular indirect action or non-flow measure, and other potentially petroleum based products, such as asphalt or plastic. The level of reduction or change to these types of resources would depend on the size and scale of the indirect action or non-flow measure. In addition, the indirect action of constructing new surface water supplies (i.e., surface water reservoir) would likely result in the use of forest land, or potentially other land uses, such that it could not be recovered or used for another purpose. This potential loss or change would depend on the size and location of a reservoir. Similar to the use of resources described above for construction and maintenance, it is expected that the operation of facilities under the following indirect actions could also result in energy expended in different forms (e.g., electricity): recycled water sources for water supply, in-delta diversions, and water supply desalination.

To the extent that SDWQ Alternatives 2 or 3 would result in the construction or maintenance of other facilities because of a method of compliance or the program of implementation, this would likely result in the use of resources that may not be recovered or recycled or may be used such that

they cannot be restored or returned to their original condition. Depending on the scale and size of the facilities described in Chapter 16, the following resources could be used such that they cannot be recovered or recycled: energy expended in the form of electricity, gasoline, diesel fuel, oil for equipment and transportation vehicles that would be needed; mined materials, such as sand, gravel, steel, lead, copper, or other metals as needed for the particular facility; and other potentially petroleum based products such as asphalt or plastic. The level of reduction or change to these types of resources would depend on the size and scale of the facility being constructed and construction footprint. To the extent the SDWQ alternatives would result in the construction of facilities (e.g., desalination facilities), those facilities likely would be constructed on lands already committed to commercial, industrial, and institutional uses. However, if facilities are not constructed near or adjacent to existing facilities (e.g., canals associated with new source water supplies or agricultural return flow salinity control), then those types of facilities could result in a change to land such that it cannot be restored or returned to its original condition. Similar to the use of resources described above for construction and maintenance, it is expected that the operation of facilities under the following indirect actions could also result in energy expended in different forms (e.g., electricity): new source water supplies, salinity pretreatment programs, desalination, and low-lift pumping stations.

The No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1) may have potentially significant impacts associated with agricultural resources associated with reduced surface water from the Stanislaus River. Similar to the effects described above for agricultural resources, this could result in agricultural lands being removed from agricultural use and converted to other uses. While the location and extent of such conversion is speculative, the LSJR alternatives could result in potentially significant irreversible environmental changes to agricultural resources. As described in Chapter 15, *Evaluation of the No Project Alternative (LSJR Alternative 1 and SDWQ Alternative 1)* if the southern Delta salinity objectives are not applied to existing municipal dischargers, then the No Project Alternative would not result in a change to the NPDES permit or other discharger requirements and the No Project Alternative would not result in the need to expand existing facilities or infrastructure. Thus significant irreversible changes would not occur and the use of resources would not occur such that they cannot be recovered or recycled. However, if the southern Delta salinity objectives are applied, then effects would be similar to those described above for SDWQ Alternatives 2 or 3. It would be expected that during construction, maintenance, and operation could result in significant irreversible changes to energy expended in the form of electricity, gasoline, diesel fuel, oil for equipment and transportation vehicles that would be needed; mined materials, such as sand, gravel, steel, lead, copper, or other metals as needed for the particular facility; and other potentially petroleum based products, such as asphalt or plastic. The level of reduction or change to these types of resources would depend on the size and scale of the facility being constructed and construction footprint under the No Project Alternative. Similarly, if facilities are not constructed near or adjacent to existing facilities (e.g., canals associated with new source water supplies or agricultural return flow salinity control) then they could result in a change to land such that it cannot be restored or returned to its original condition.

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