Chapter 21
Utilities and Service Systems

21.1 Affected Environment

This chapter describes the affected environment related to utilities and service systems for the dam and reservoir modifications proposed under SLWRI action alternatives.

Because of the potential influence of the proposed modification of Shasta Dam, and subsequent water deliveries over a large geographic area, the SLWRI includes both a primary and an extended study area. The primary area has been further divided into Shasta Lake and vicinity and upper Sacramento River (Shasta Dam to Red Bluff). The extended study area has been further divided into the lower Sacramento River and Delta and the CVP/SWP service areas.

The utilities and service systems addressed are water supply in the Shasta Lake and vicinity portion of the primary study area, wastewater infrastructure, stormwater drainage and infrastructure, solid waste management, electrical service and infrastructure, natural gas service and infrastructure, and telecommunications infrastructure. Hydropower generation, public services (e.g., fire protection law enforcement, emergency services), roadways and bridges, and recreation are addressed in separate chapters.

The utilities and service systems setting for the Shasta Lake and vicinity portion of the primary study area consists of the portion of Shasta County above Shasta Dam and includes the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). Utilities and service systems are influenced by rugged, mountainous terrain; lakeside communities; and Shasta Lake. The utilities and service systems setting for the upper Sacramento River portion of the primary study area consists of Shasta County below Shasta Dam and Tehama County. Two incorporated cities, Redding and Red Bluff, necessitate urban utilities and service systems needs in the otherwise rural upper Sacramento Valley, which is characterized by rolling hills with mountains to the north, east, and west.

The utilities and service systems setting for the extended study area consists of 21 counties downstream from the Red Bluff Pumping Plant and encompasses all areas served by the CVP and the SWP. A discussion of project impacts on CVP/SWP water supply and overall CVP and SWP management and operations is provided in the EIS, Chapter 6, “Hydrology, Hydraulics, and Water Management,” and in the *Hydrology, Hydraulics, and Water Management Technical Report*.

21.1.1 Water Supply

Shasta Lake and Vicinity

Water supplies for the Shasta Lake and vicinity portion of the primary study area are provided in one of three ways: by a community service area (CSA) run by Shasta County, by a mutual water company, or by an individual or group well. CSA #2 provides water for the Sugarloaf community, and CSA #6 provides water for the Silverthorn community. Fifteen mutual water companies serve the Shasta Lake and vicinity portion of the primary study area. Mutual water companies are cooperative or mutual associations that furnish water to resorts and other developments (Reclamation 2007) (Figure 21-1).

Upper Sacramento River (Shasta Dam to Red Bluff)

Provided below are descriptions of each entity in Shasta County that currently relies on Reclamation to provide a portion of its water supply and the associated Shasta and Trinity River diversions and facilities. This information was taken from the *Final Environmental Assessment for the Long-Term Contract Renewal Shasta and Trinity River Divisions* (Reclamation 2005).

City of Redding (Sacramento River, Spring Creek, Toyon) Before 1941, water service for the City of Redding was provided by the California Water Service Company, which had water rights to the Sacramento River dating from 1886. The City of Redding acquired the local facilities and water rights of the company in 1941 and filed for an additional appropriative water right of 5 cubic feet per second in 1944. Subsequent annexations to the City of Redding's service area consist of the Buckeye County Water District, the Cascade Community Services District, and the Enterprise Public Utility District in 1967, 1976, and 1977, respectively.

The Buckeye zone service area includes two City of Redding pressure zones: Buckeye and Summit City. Approximately half of the Buckeye zone is located within the Redding city limits, and the other half is in an unincorporated area of Shasta County. Approximately one-quarter of the Summit City zone is in an unincorporated area of Shasta County, and three-quarters is in the City of Shasta Lake. The City of Redding currently receives water to its Buckeye zone under a long-term CVP contract with Reclamation (the water comes from Whiskeytown Lake via the Spring Creek tunnel). There are no known groundwater resources within the Buckeye zone service area. During peak-demand periods, supplemental water is pumped from the Sacramento River, then treated and delivered into the Buckeye zone service area. The municipal and industrial (M&I) connections in the Summit City zone are supplied exclusively by water diverted from Shasta Lake via the Toyon pipeline. The water is treated by the City of Shasta Lake and delivered to the Summit City zone.

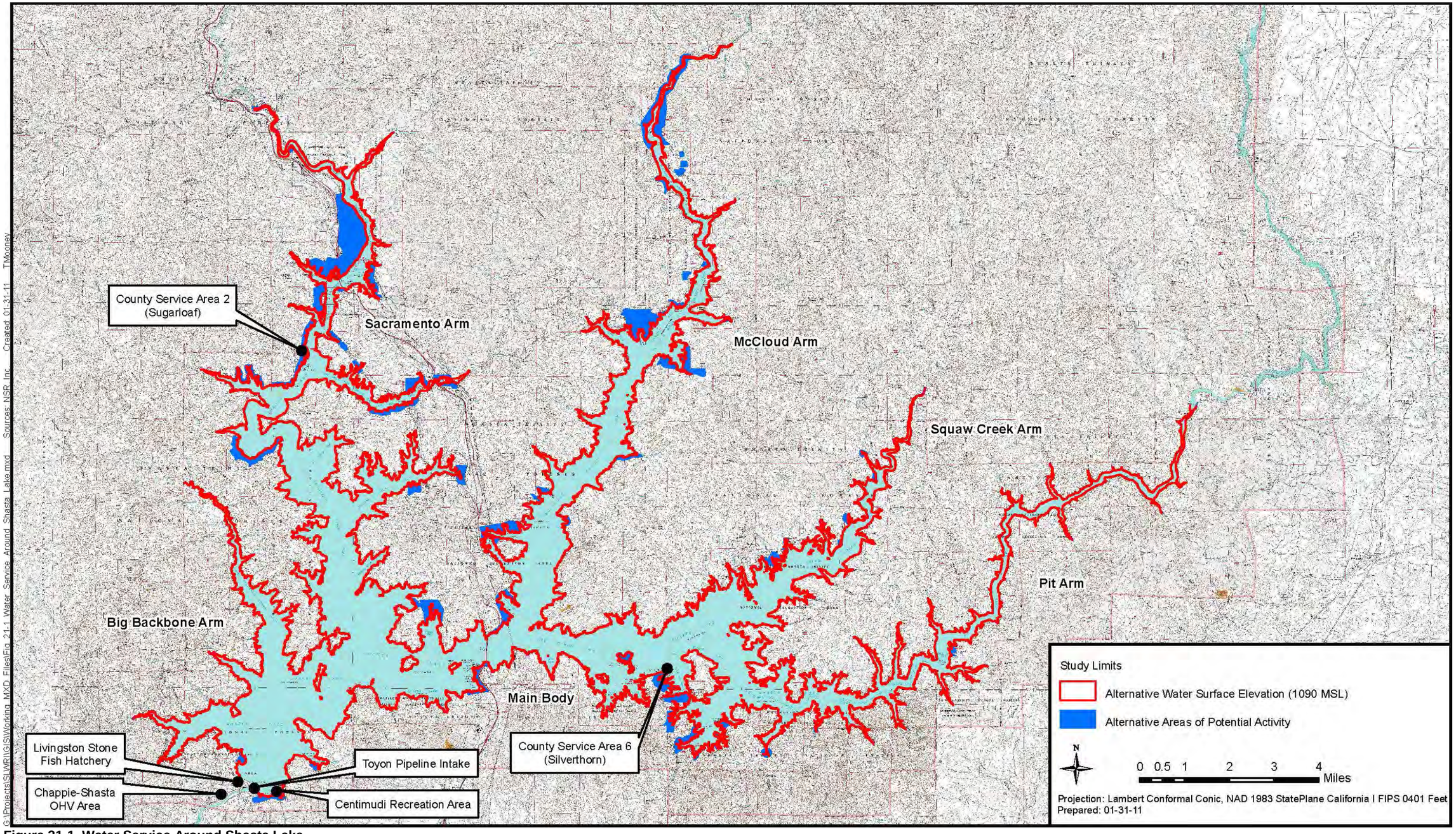

Figure 21-1. Water Service Around Shasta Lake

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The City of Redding has one additional water contract with Reclamation. Redding's 1966 Settlement Contract with Reclamation specifies a base supply and a project water supply. In 2003, the maximum base supply was set at 17,850 acre-feet per year, and the project water supply was set at 3,150 acre-feet per year; since 1995, project water supply entitlements have been increased by 45 acre-feet annually.

Redding's surface-water supply comes from the Sacramento River and Whiskeytown Lake. Sacramento River water is treated at the Foothill Water Treatment Plant (24 million gallons per day (mgd)), and Whiskeytown Lake water is treated at the 7-mgd Buckeye Water Treatment Plant. Redding supplements its surface-water supply with well production capacity from the Redding groundwater basin primarily during peak-demand periods. Currently, 14 wells are operational, providing a total capacity of up to 12 mgd.

Redding provides CVP and non-CVP water service to about 24,709 connections. Connections provide water primarily for M&I uses and a small number of agricultural uses. The city administers 4,179 connections in the Buckeye zone and 58 M&I connections in the Summit City zone.

City of Shasta Lake Water for the City of Shasta Lake comes from Shasta Lake via a pump station at Shasta Dam that has a maximum diversion of 9.3 mgd. Water is pumped from an intake in the face of Shasta Dam through the Toyon pipeline to a storage/treatment facility immediately east of the Shasta Dam compound. From there it is delivered to the City of Shasta Lake (Figure 21-1). An interim contract with Reclamation (Contract No. 4-7-20-W1134-IR10) provides an allocation of 4,400 acre-feet per year from this source. Reclaimed water is also available for industrial and landscaping use. Groundwater use is limited because of low aquifer yields.

Before incorporation, the community water supply and utility services were provided by the Shasta Dam Area Public Utilities District (PUD), which was formed in 1945 to provide a reliable water supply for an area of 3.5 square miles. Originally, the PUD service area was a residential area established to house workers who were constructing Shasta Dam. Reclamation constructed the Toyon pipeline to transport water from Shasta Lake to the PUD in 1948, and the PUD concurrently constructed water storage and distribution systems. The Summit City PUD was annexed in 1978. Before annexation, water was supplied by a series of wells with low and unreliable yields.

The City of Shasta Lake provides water service to 3,800 connections for primarily urban and residential uses, although industrial use has increased over the past decade. The City of Shasta Lake also provides water service to Reclamation's Northern California Area Office.

Bella Vista Water District The Bella Vista Water District (BVWD) is a publicly owned water agency formed in 1957 to serve agricultural irrigation

demands (California Water Code Division 13, Sections 34000–38501). The BVWD service area is located generally east of Redding and south of Shasta Lake. The service area includes the rural communities of Bella Vista and Palo Cedro.

BVWD's primary water source is the Sacramento River. The BVWD supply system consists of the Wintu Pump Station on the Sacramento River and five wells. Water pumped from the river is treated at the district's treatment plant, which provides inline filtration. Distribution facilities include a network of transmission and distribution pipelines, three storage tanks, nine booster pump stations, and pressure-reducing facilities. The major distribution piping was initially constructed by Reclamation but has been expanded over time. The main supply system is still Federally owned, but it was constructed solely for use by BVWD. Both domestic and agricultural users are served through the same distribution system, so all water is treated to meet the higher water quality standards for domestic use. The CVP water that BVWD purchases from the Shasta County Water Agency (SCWA) is described below.

BVWD's original contract allows for up to 24,000 acre-feet per year, which is supplemented with 578 acre-feet per year of CVP water purchased through SCWA. Both of these allotments are subject to reduction during dry years. In the severe drought years of 1991 and 1992, water supplies for M&I were reduced by 25 percent and water for agricultural uses was reduced by 75 percent. Available surface water was supplemented with groundwater from wells located near the southern boundary of the district. These reductions in supply caused severe drought restrictions to be imposed, which have had a continuing impact on district water sales. The supplementary water provided by the wells constitutes about 10 percent of the supply normally available from the Sacramento River and about 15–20 percent of the reduced supply during a severe drought year. The aquifers in the district have limited yield, so it is not practical to greatly increase the production of wells in the district.

Agricultural and irrigation still represent 70–80 percent of the district's water demand. However, most of the service connections are now either domestic or rural residential. BVWD currently has 4,538 residential connections and 615 agricultural connections. Urban uses predominate in the southeast portion of the district where sewage disposal facilities are available. Residential uses, with lot sizes between 1 and 5 acres, are dispersed across the rest of the district. Agricultural uses are almost exclusively confined to the fertile soil along Stillwater Creek and Cow Creek. Pasture represents the bulk of agricultural use, although there is a broad range of other crops.

Centerville Community Services District The Centerville Community Services District (CCSD) was originally formed in September 1959 to supply water for domestic use, irrigation, sanitation, industrial use, fire protection, and recreation (California Government Code, Division 3, Community Services Districts, Section 61000 et seq.). The CCSD service boundary encompasses

11,278 acres in the unincorporated area of Shasta County immediately west of Redding.

The source of the district's water supply is Whiskeytown Lake, a key feature of the Trinity River Division of the CVP. This reservoir covers about 3,250 acres at maximum capacity and provides water storage of about 241 thousand acre-feet. The reservoir regulates the flows of the Clear Creek watershed and the imported flows from the Trinity River, which discharge through the Carr Powerhouse into the reservoir.

Designed and constructed by Reclamation, the district's water system dates back to 1967. Water is diverted to the district through 2 intakes in Whiskeytown Dam, 1 at an elevation of 1,110 feet and the other at an elevation of 965 feet. The ability to select the depth of the diverted water gives CCSD the capacity to draw less turbid water. The water is treated at a 30-mgd-capacity plant located at the base of Whiskeytown Dam. CCSD shares the inline treatment facility with the Clear Creek Community Services District (CCCSD).

Treated water is distributed to the district through an aqueduct that begins at Whiskeytown Dam and terminates at a 250,000-gallon control tank about 8.5 miles south of the dam. This aqueduct, commonly called the Muletown Aqueduct (also Muletown Conduit), consists of about 27,500 feet of 45-inch pipe and 17,400 feet of 42-inch pipe buried along Muletown Road, paralleling Clear Creek. The steel pipe, lined and coated in coal tar, was installed in 1965.

CCSD has a contract with CCCSD that allocates CCSD a 25 percent share of the capacity. CCSD holds 2 contracts with Reclamation for a total allocation of 3,800 acre-feet per year. The first contract, entered into on April 11, 2001, is an assignment contract. This contract permanently assigned 2,900 acre-feet per year of CVP water from SCWA's 5,000 acre-feet per year contract with Reclamation. This contract carries with it those terms and conditions defined in SCWA's contract, which also includes a binding agreement for early renewal. The second contract, entered into on August 11, 2000, is an exchange contract. This contract with Reclamation for 900 acre-feet per year was intended to provide CCSD with substitute project water for its pre-1914 water rights on Clear Creek. The district does not have access to a groundwater supply source.

CCSD currently provides M&I water to 1,125 metered connections that serve a population of approximately 2,850.

Clear Creek Community Services District CCCSD was formed in 1961 and encompasses about 14,314 acres. The facilities were designed and constructed by Reclamation, and CCCSD began operating in 1967. CCCSD is located approximately 10 miles southwest of Redding and 6 miles west of Anderson in southern Shasta County. The district's service area includes the rural areas known as Olinda and Cloverdale. The general area served by the district is commonly known as Happy Valley.

The source and treatment of CCCSD water is the same as those of CCSD water; water from Whiskeytown Lake is treated and diverted to service connections via the Muletown Aqueduct. The distribution system within the district's boundaries consists of approximately 75 miles of pipe ranging in size from 2 inches to 45 inches. Title to the distribution line system was transferred to CCCSD on May 29, 2001.

CCCSD has 1 storage tank along the aqueduct with a capacity of 1 million gallons. A control tank with a 250,000-gallon capacity regulates pressure at the upper elevation of the district. A 32,000-gallon storage tank is located outside of the district boundary at the booster station facility.

The district has developed the first of 3 planned wells, and it has installed 13,800 feet of 18-inch pipeline to connect a groundwater supply to the distribution system. The first well attached to the distribution system (Well #1) became operational in October 1992. Well #1 and the two proposed wells are intended for use only when surface supplies are inadequate to meet emergency demands.

CCCSD currently provides service for approximately 5,817 acres of irrigated agricultural land and approximately 4,000 acres of rural residences receiving M&I water. Approximately 4,497 acres in the district are undeveloped. The majority of the developed agricultural property in the district is ditch or flood irrigated. The balance of irrigation is done by overhead and drip systems.

Shasta Community Services District The Shasta Community Services District (SCSD), located west of Redding, was formed in 1959 to supply water for domestic use and fire protection for the area generally referred to as Old Shasta (Community Services District Laws: California Government Code, Sections 61000–61934). Congress authorized a water system for the area as part of the Trinity River Division of the CVP. Bonds that were issued by SCSD to finance construction of the transmission and distribution systems have been repaid.

A long-term CVP water service contract provides up to 1,000 acre-feet annually. Water is supplied by gravity from Whiskeytown Lake via a turnout on the Spring Creek conduit. The Spring Creek conduit is the only source of supply, and there are only 0.30 million gallons of storage located near the source. Downstream from the turnout, a single transmission main serves as the backbone of the distribution system and most mains are not looped. Historically, SCSD has been vulnerable to disruptions in supply from its Reclamation contract. During the 1991 drought, Reclamation reduced SCSD's allotment by 25 percent to 750 acre-feet per year.

The district currently serves 630 connections. Virtually all of the active land use is residential or municipal, consisting primarily of ranchettes. Wells are not feasible because the district does not lie over an aquifer.

Shasta County Water Agency SCWA was formed in 1957 to develop water resources for Shasta County (Shasta County Water Agency Act (Legislative Act 7580)). SCWA evolved from the Shasta County Department of Water Resources, which organized Shasta County efforts in conjunction with the Trinity River Division of the CVP.

SCWA has assisted with the creation of BVWD, CCSD, CCCSD, and SCSD and helped create CSAs for water and sewer services in Shasta County. The agency also acts as staff to the Redding Area Water Council, a group that works to preserve the quality and quantity of water in the Redding groundwater basin. Funding for SCWA comes from Shasta County property taxes.

Other Shasta and Trinity River Divisions CVP Contractors Three smaller water districts (see below) are served by either the Shasta or Trinity River division of the CVP. The three districts constitute about 1 percent of the CVP long-term contract water supply to the divisions.

Keswick County Service Area The Keswick County Service Area (KCSA), located west of Redding, was formed in 1990 (California Government Code, Sections 25210.1–25250). Previously, KCSA operated as the Keswick Community Services District, which was formed in the early 1960s to supply water for domestic use and fire protection for the town of Keswick and adjacent developed areas (California Government Code Section 61000 et seq.). The district boundary encompasses Keswick Dam and the Spring Creek Diversion Dam; however, these facilities are not served by the district.

Congress authorized a water system for the Keswick area as part of the Trinity Project Act (69 Stat. 719), and the facilities were constructed in 1965. A repayment schedule was established whereby the Federal government would be reimbursed by KCSA for delivery system construction costs. On completion of repayment, ownership of all project facilities was to remain with the Federal government.

The water source for KCSA is Whiskeytown Lake. Water is transported by gravity flow to a turnout on the Spring Creek conduit that is located upstream from the Spring Creek powerhouse. Two storage tanks provide 0.2 million gallons of storage.

A CVP water service contract provides for up to 500 acre-feet annually. KCSA serves about 195 connections, which are concentrated in the town of Keswick. Land served by KCSA is exclusively rural residential properties.

Mountain Gate Community Services District The Mountain Gate Community Services District (MGCSD) was initially formed in 1956 to provide water service for a 2-square-mile area north of the City of Shasta Lake (California Government Code, Section 61000 et seq.). The water source for MGCSD is Shasta Lake. The distribution system consists of 29 miles of pipelines that serve

3,750 acres in MGCSD and Bridge Bay Resort (located between the Sacramento and McCloud arms of Shasta Lake on USFS land).

A CVP water service contract provides 350 acre-feet annually. District water supplies are supplemented by a contract with SCWA that provides 1,000 acre-feet annually. MGCSD also operates three wells that take water from a local aquifer. The wells supply nearly half of MGCSD's total needs. There is no water storage in the district.

MGCSD provides water service to 593 connections and fire protection services for its service area. Although MGCSD primarily provides water for residential uses, it also serves M&I customers.

U.S. Forest Service A memorandum of agreement between USFS and Reclamation provides USFS with up to 10 acre-feet of municipal, industrial, and domestic water diverted from the City of Shasta Lake's water main to supply the Centimudi Recreation Area (Figure 21-1). The Centimudi facilities continue to receive water under this memorandum of agreement.

Livingston Stone National Fish Hatchery The Livingston Stone National Fish Hatchery is located near the foot of Shasta Dam and is managed by USFWS. The hatchery receives its water from the penstocks of Shasta Dam. Water flows through pipes fitted with pressure-reducing valves that pierce manhole covers near the bases of the penstocks. Then the water is routed via a buried pipeline to the hatchery, where it passes through a degassing device, flows through the hatchery, and then returns to the Sacramento River.

Other Users of Lake Water Some of the recreation residences at Campbell Creek and Didallis draw water from the lake for domestic uses. Also, some marinas draw raw water from the lake for washing out boats. Return water drains back into the lake.

Shasta County Water supplies in Shasta County are provided by the CVP, surface water diversions, and groundwater wells. The City of Redding uses groundwater wells for 40 percent of its water supply to supplement the CVP water sources described in the preceding section. Maximum available groundwater production is approximately 19,000 acre-feet per year. Most city groundwater comes from 10 wells located near Redding Municipal Airport, within the Redding groundwater basin. These wells supply a maximum of 16.5 mgd. Four additional wells in the county supply a maximum of 0.7 mgd.

Tehama County Water supplies in Tehama County are provided by CVP, local surface water diversions, and groundwater wells. The recent trend in the county is a shift from reliance on CVP water supplies to groundwater supplies. There are more than 10,000 wells designated for domestic, irrigation, municipal, monitoring, and other uses in the county. CVP deliveries provide 21,300 acre-feet per year; local stream diversions provide 106,300 acre-feet in a normal

water year; and groundwater provides approximately 382,000 acre-feet per year, which represents two-thirds of the county's irrigated water supply.

Red Bluff The City of Red Bluff obtains all of its water from 14 wells. It maintains a 3-million-gallon storage tank used for equalizing storage, fire flow, and emergency storage. The City of Red Bluff is in the process of seeking funding for an additional storage tank similar to the first. The wells produce between 500 and 2,500 gallons per minute, with the majority producing between 800 and 1,000 gallons per minute. Well depths range from 150 to 250 feet.

Other Nearby Uses The Chappie-Shasta Off-Highway Vehicle Area and residential and commercial uses in the community of Coram draw water from local groundwater wells.

Lower Sacramento River and Delta and CVP/SWP Service Areas The overall CVP/SWP water supply discussion describes the environmental setting for water supply for the extended study area. Other water supplies come from local surface water diversions and wells, which serve domestic, irrigation, municipal, and commercial uses. A detailed discussion of the overall CVP and SWP management and operations is provided in EIS Chapter 6, "Hydrology, Hydraulics, and Water Management," and in the *Hydrology, Hydraulics, and Water Management Technical Report*.

21.1.2 Wastewater Infrastructure

Shasta Lake and Vicinity

Wastewater is treated and returned to the natural environment using one of several technical methods with either community or individual on-site disposal systems. Most residential, commercial, and recreational developments located in the Shasta Lake and vicinity portion of the primary study area use on-site septic tank/leachfield systems for wastewater treatment. Typically, individual homes, cabins, or businesses are routed to individual septic systems. Large resorts route septic from several buildings to a single tank/leachfield system. Campgrounds and public restrooms use either septic tank/leachfield systems or vault/pit toilets (Reclamation 2007). Marinas also use booster pumps to lift gray water to upslope leachfield areas. No large wastewater collection or treatment systems are located near Shasta Lake.

The highest concentrations of wastewater facilities near Shasta Lake are located in the Lakeshore and Sugarloaf areas, with a substantial number of facilities in the Bridge Bay, Holiday Harbor, Salt Creek, Campbell Creek, Silverthorn, Jones Valley, Tsasdi Resort, and Digger Bay Marina areas (Figure 21-2). The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the wastewater facilities in the ancillary areas near Shasta Lake (Reclamation 2007).

Upper Sacramento River (Shasta Dam to Red Bluff)

Many areas scattered throughout Shasta and Tehama counties are serviced by individual septic systems. The remaining wastewater treatment systems are a form of community collection, treatment, and disposal. The most common form of community system is the treatment plant, which discharges treated effluent to a storage and irrigation system (land disposal) or, diluted, to a surface watercourse.

Below Shasta Dam, a number of community wastewater systems are operated by the cities of Anderson, Redding, Red Bluff, and Shasta Lake. Several unincorporated communities have community wastewater systems that are operated by CSAs.

Redding operates both the Clear Creek Wastewater Treatment Plant (WWTP) and Stillwater WWTP, both of which discharge treated effluent year round to the Sacramento River. The Clear Creek WWTP is currently permitted by the Central Valley Regional Water Quality Control Board to discharge up to 8.8 mgd of average dry-weather flow into the Sacramento River. The wastewater receives advanced secondary treatment. The Stillwater WWTP receives an average of 2.0 mgd of wastewater, approximately one-third of its design capacity of 6 mgd for average dry-weather flow. The Anderson WWTP discharges year round into the Sacramento River at a location approximately 0.25 mile from the Stillwater WWTP.

The City of Shasta Lake operates a large community wastewater system that is permitted to seasonally discharge treated effluent to surface water, namely Churn Creek; a major goal of the city's capital improvement plan has been to significantly reduce these discharges. Churn Creek eventually discharges to the Sacramento River about 0.5 mile upstream from the Stillwater WWTP.

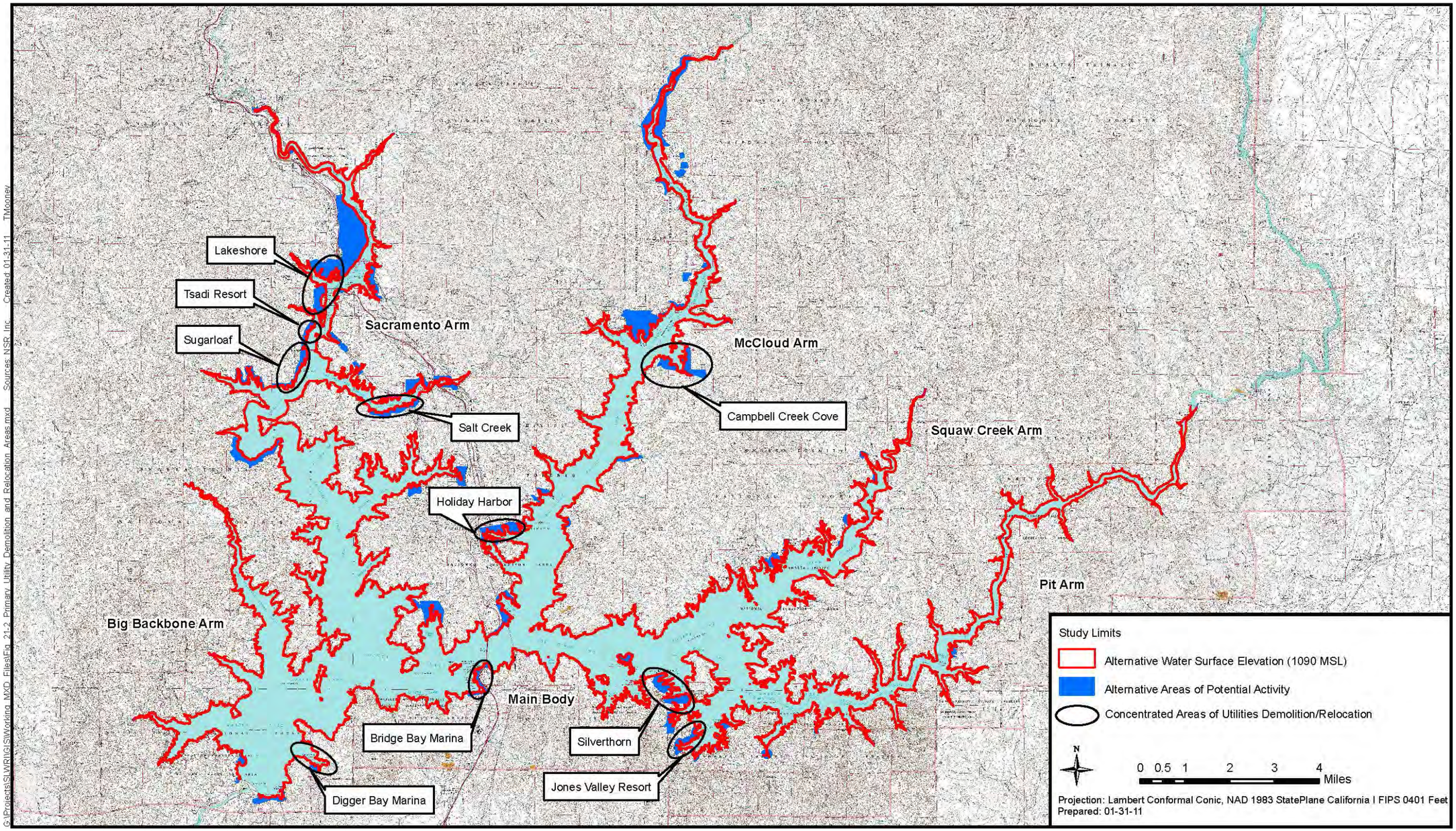

Figure 21-2. Primary Utility Demolition and Relocation Areas

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The Red Bluff WWTP has a treatment capacity of 4.8 mgd and discharges tertiary-treated wastewater by gravity into the Sacramento River at approximately 1.4 mgd. The City of Red Bluff operates a wastewater treatment system at the south end of the city. The Rio Alto Water District provides wastewater treatment services for some portions of the community of Cottonwood. Septic/leachfield systems or seepage pits are used in areas not served by these systems.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Wastewater systems in the extended study area are similar to those discussed for the primary study area. Community wastewater service systems are provided through a collection network of gravity and force main sewer lines operated primarily by local utility agencies. Pump stations and lift stations augment sewer line networks. These conveyance systems terminate at WWTPs that discharge treated effluent to storage and irrigation systems (land disposal) or to surface watercourses where the treated effluent is diluted. Individual on-site wastewater treatment methods are also used where the land is able to accommodate a leachfield/septic tank system.

21.1.3 Stormwater Drainage and Infrastructure

Shasta Lake and Vicinity

Stormwater drainage is primarily a function of the precipitation and runoff characteristics of a watershed. About 6.5 percent (5.8 million acre-feet) of all surface runoff in the state of California originates in Shasta County, representing a substantial portion of the total surface runoff in the Sacramento River system. Runoff in the Shasta Lake and vicinity portion of the primary study area is discharged to the McCloud River, the Sacramento River, and the Pit River, which drain into Shasta Lake. Numerous creeks and small local tributaries also drain into Shasta Lake.

The California Department of Transportation maintains a stormwater drainage system along the Interstate 5 (I-5) corridor. Drainage facilities in developed communities include gutters, swales, ditches, culverts, storm drain inlets, catch basins, storm drainage pipes, and detention basins. Roads also channel stormwater drainage from residences, commercial, and industrial land uses to adjacent lands and stormwater drains.

Upper Sacramento River (Shasta Dam to Red Bluff)

Runoff in the upper Sacramento River portion of the primary study area is discharged to the Sacramento River directly and indirectly via numerous major creeks and small local tributaries in rural and urban areas. Stormwater drainage in undeveloped portions of Shasta and Tehama counties generally consists of natural swales and topographic features.

Stormwater collection systems are present in urban areas and developed communities. Drainage facilities in urban areas include gutters, swales, ditches,

culverts, storm drain inlets, catch basins, storm drainage pipes, canals, detention basins, and pump stations. Roads also channel stormwater drainage from residences and commercial and industrial land uses to adjacent lands and stormwater drains. The Cities of Redding, Anderson, and Red Bluff and the City of Shasta Lake each operate municipal storm drainage systems in the city limits. The California Department of Transportation's I-5 stormwater drainage system continues along I-5 in the upper Sacramento River area.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Stormwater systems in the extended study area are similar to those discussed for the primary study area. Various storm drainage facilities and collection/conveyance systems are located throughout the extended study area. Stormwater facilities and infrastructure are operated primarily by local districts and road departments, and include gutters, swales, ditches, culverts, storm drain inlets, catch basins, storm drainage pipes, canals, detention basins, and pump stations. Treated stormwater is often discharged to rivers, tributaries, and major creeks throughout the extended study area.

21.1.4 Solid Waste Management

Shasta Lake and Vicinity

Contractors, under the auspices of Shasta County, provide solid waste disposal services for the private sector. The Shasta-Trinity National Forest (STNF), Reclamation, and California Department of Transportation use contractors to provide disposal services for facilities on public lands. A number of sites are used to collect solid waste and recyclables, which are later transferred to landfills or recycling centers in the extended study area, primarily in Shasta County.

Upper Sacramento River (Shasta Dam to Red Bluff)

The Shasta County Department of Public Works is responsible for providing solid waste management in unincorporated areas of the county. Three landfills (West Central Landfill, Anderson Landfill, and Twin Bridges Landfill) and 11 collection/transfer stations are currently operating in Shasta County. Shasta County generated 187,909 tons of solid waste in 2006; however, 307,568 tons of solid waste were disposed of in the county during the same period (CIWMB 2008).

In 2006, the 1,200-acre West Central Landfill received approximately 417 tons per day (CIWMB 2008) of nonhazardous waste from residential, commercial, industrial, and agricultural sources. This Class III landfill has a permitted capacity of 7,078,000 cubic yards and a storage area of 107 acres. In 2001, the State of California estimated that the landfill had a remaining capacity of 6,606,000 cubic yards (CalRecycle 2010). Under existing State permits, the landfill has sufficient capacity to accommodate the disposal of solid waste at least until the year 2019. In 2006, the 246-acre Anderson Landfill, a Class III landfill and asbestos-containing waste disposal site, received approximately 426

tons of solid waste per day (CIWMB 2008). This landfill has a permitted capacity of 16,840,000 cubic yards, and in 2008 the State of California estimated that the landfill had a remaining capacity of 11,914,000 cubic yards (CalRecycle 2010). The estimated year of closure is 2055. The Twin Bridges Landfill is a Class II landfill that has ceased accepting solid waste and is undergoing closure (CIWMB 2008).

Tehama County operates the 102-acre Tehama County/Red Bluff Sanitary Landfill, located approximately 2.5 miles northwest of Red Bluff. This landfill, a Class III facility, has a maximum permitted daily capacity of 400 tons (CIWMB 2008). This landfill has a permitted capacity of 5,097,000 cubic yards, and in 2008 the State of California estimated that the landfill had a remaining capacity of 2,149,000 cubic yards (CalRecycle 2010). The estimated year of closure is 2040. The landfill is owned by the Tehama County Sanitary Landfill Association, a joint-powers authority composed of Tehama County and the cities of Red Bluff, Corning, and Tehama. The Tehama County/Red Bluff Landfill Management Agency oversees daily landfill operations at the Tehama County/Red Bluff Landfill and at the Material Recovery Facility. Tehama County/Red Bluff Landfill Management Agency is another joint-powers authority and is composed of Tehama County and the City of Red Bluff. This agency is also responsible for maintaining permits and monitoring environmental compliance at the landfill.

In addition to the landfill and material recovery facilities, Tehama County operates two household hazardous waste facilities, in Corning and Red Bluff, and four transfer stations in the outlying rural areas of Manton, Payne's Creek, Mineral, and Rancho Tehama. There are no facilities authorized to accept commercial hazardous waste within the primary study area.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Solid waste services and infrastructure in the extended study area are similar to those discussed for the primary service area. Urban centers in the extended study area may generate more solid waste than the population centers in the primary study area; however, the mechanisms used for transfer and disposal of the waste are similar. Solid waste facilities, including landfills and transfer stations, provide pickup and disposal services. There are three commercial hazardous waste disposal facilities authorized to accept various types of commercial hazardous waste in the extended study area. These facilities are located in Kings, Kern, and Imperial counties. Only the facility in Kings County is certified to accept materials that contain polychlorinated biphenyls.

21.1.5 Electrical Service and Infrastructure

Shasta Lake and Vicinity

Pacific Gas and Electric Company (PG&E), the City of Redding, and the City of Shasta Lake provide electrical service to Shasta Lake and vicinity. The PG&E service area is part of a larger PG&E territory, which encompasses

70,000 square miles in northern and central California, from Eureka in the north to Bakersfield in the south. Power transmission facilities serving the Shasta Lake and vicinity portion of the primary study area have developed mostly parallel to I-5 and adjacent to developed communities.

Currently, PG&E is capable of providing three-phase power parallel to the I-5 corridor, north to Bridge Bay and south from Lakehead to Turntable Bay. Power lines around Shasta Lake are typically routed overhead on utility poles or towers, although a portion of the lines serving individual businesses, homes, and cabins are routed underground. Power lines serving the Shasta Lake and vicinity portion of the primary study area are frequently attached to bridges when routed over rivers and lake inlets. The voltage of local distribution lines is typically 12 kilovolts (kV), whereas the voltage of high-voltage power transmission lines is typically 60–230 kV. Service to individual homes and businesses is typically 120–480 volts.

The highest concentrations of electrical service facilities near Shasta Lake are in the Lakeshore and Sugarloaf areas, with a substantial number of facilities in the Bridge Bay, Holiday Harbor, Salt Creek, Campbell Creek, Silverthorn, Jones Valley, Tsasdi Resort, and Digger Bay Marina areas (Figure 21-2). The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the electrical service facilities in the ancillary areas near Shasta Lake (Reclamation 2007).

The City of Shasta Lake is located at the heart of the Shasta Division of the CVP. The City of Shasta Lake is the successor utility to the former Shasta Dam Area PUD and serves customer both upstream and downstream from Shasta Dam. The PUD contracted with Reclamation for power in January 1947 to serve electrical energy to residents and businesses. The PUD received 13.8kV service from the Shasta Dam switchyard on a leased-line arrangement. Today, the City of Shasta Lake is a load serving entity and retail distribution provider of electrical energy to more than 4,500 homes and businesses including Digger Bay Marina, the Centimudi Boat Ramp, and the Fisherman’s Point Picnic Area facilities.

Upper Sacramento River (Shasta Dam to Red Bluff)

Electrical service and related infrastructure in the upper Sacramento River portion of the primary study area are similar to those discussed for the Shasta Lake and vicinity portion. The City of Anderson, outlying rural areas of Shasta County, and Tehama County (Red Bluff and Corning) receive electrical service from PG&E.

The City of Shasta Lake owns and operates a looped 115kV system, which delivers energy to two 115/12kV distribution substations that step the voltage down to 12kV for delivery to the end users. The system is managed by the City of Shasta Lake and is assisted by the City of Redding Electric Utility for ancillary services. In total, the City of Shasta Lake’s distribution system has 15

miles of 115kV transmission lines and approximately 67 miles of overhead and underground 12kV distribution lines. The City of Shasta Lake has two points of delivery: one from the Flanagan 230/115kV transmission substation and the other at Keswick Dam switchyard. The City of Shasta Lake has a base resource allocation from the Western Area Power Administration (Western), which delivers energy to the City of Shasta Lake from Shasta and Keswick Dams. The City of Shasta Lake also has a supplemental energy agreement with the City of Redding.

The City of Redding's electric system is managed by the Redding Electric Utility. It receives nearly eight percent of the hydroelectric output from the CVP, which amounts to approximately 30 percent of Redding's annual power supply. Federal hydropower from the CVP is the most cost-effective, renewable, and carbon-free resource currently in Redding's power supply portfolio. The City of Redding owns and operates a looped 115kV system, which delivers energy to eleven 115/12kV distribution substations that step the voltage down to 12 kV for delivery to the city's customers. . In total, Redding's distribution system has 67.3 miles of 115kV local transmission lines and approximately 610 miles of overhead and underground 12kV distribution lines. Delivery of all power from outside the city is made to the Redding Municipal Airport 230/115kV transmission substation and to the Keswick Dam switchyard. Redding jointly owns the airport substation with Western. Western owns and operates the Keswick switching substation and an electrical transmission line that runs north and south along the western side of Redding and the City of Shasta Lake.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Electrical services and infrastructure in the extended study area are similar to those discussed for the primary study area. Power generation and transmission facilities have developed parallel to population centers, power, natural gas, nuclear, oil, hydroelectric, wind, solar, and other technologies used for power production.

Infrastructure in the Sacramento River basin downstream from the Red Bluff Pumping Plant, the American River basin, and the San Joaquin River basin consists primarily of natural gas–fired and hydroelectric generating facilities, transmission lines, substations, and distribution lines. In the Delta, PG&E and Western have developed power transmission lines across Delta islands and waterways. Many of the corridors are within the periphery of the Delta upland areas, including several natural gas–fired plants. There are no power-generating facilities in the central Delta. In other portions of the CVP and SWP service areas, a complex system of electrical generating facilities, substations, and transmission infrastructure exists.

21.1.6 Natural Gas Service and Infrastructure

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

PG&E is responsible for providing natural gas service to the primary study area. Gas is delivered to customers below Shasta Dam, including residents of the cities of Redding, Anderson, and Red Bluff and the city of Shasta Lake. Although the study area is bisected by a large PG&E natural gas pipeline, service varies based on PG&E's distribution system. No natural gas facilities are present in the Shasta Lake and vicinity portion of the primary study area.

The USFS facility at Turntable Bay, the USFS Lakeshore Guard Station, and a number of rural residences and businesses in the primary study area rely on propane for various purposes. Propane is supplied by various local providers to individual on-site tanks. Propane tanks for homes and businesses are portable and are typically leased (Reclamation 2007).

Lower Sacramento River and Delta and CVP/SWP Service Areas

Natural gas services and infrastructure are located throughout the extended study area and are supplied by various energy providers. Pipelines, storage areas, and compressor stations are located in the Sacramento River and San Joaquin River valleys and in the CVP/SWP service areas. Natural gas discovered in the Delta region has been developed into a significant supply source and depot for underground storage. Gas fields, pipelines, and related infrastructure have been developed throughout the CVP/SWP service areas. Natural gas infrastructure is owned by oil and gas companies, public utilities, and various independent leaseholders.

21.1.7 Telecommunications

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Landline telephone service in the primary study area is provided by various commercial communications companies. The majority of the landline facilities are located in county- or city-owned rights-of-way and on private easements. Telecommunications lines are either copper wire or fiber optic cable and are routed overhead on utility poles and underground. Telephone lines are frequently attached to bridges when routed over rivers and lake inlets. There are no transcontinental fiber optic lines in the Shasta Lake and vicinity portion of the primary study area.

In addition to landline service, a large number of communications towers have been constructed throughout the primary study area for cellular phone service. Cellular towers have been erected along major travel corridors to meet emergency service objectives. Cellular service is available, to varying degrees, throughout the service area.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Telecommunications systems in the extended study area are similar to those discussed for the primary study area and are supplied by various providers. Associated infrastructure is located throughout the extended study area and consists of underground fiber optic cable, telephone transmission lines (overhead and underground), and cellular towers owned or leased by telecommunications service providers.

21.2 Regulatory Framework

21.2.1 Federal

Reclamation Act

The 1902 Reclamation Act authorized the Federal government to finance and build water supply projects. The act set up the Reclamation Fund to finance single-purpose irrigation projects in the western United States. Since that time, water supply projects and the financing needed to construct and maintain infrastructure have grown substantially. The act has been amended several times, most recently in 1982 with the passage of the Reclamation Reform Act.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was passed to protect public health by regulating the nation's drinking water supply. The law requires many actions to protect drinking water and its sources: rivers, lakes, reservoirs, springs, and groundwater wells. Originally, the SDWA focused on water treatment as the primary means to provide safe drinking water at the tap. In 1996, amendments to the SDWA expanded the act to include source water protections.

The U.S. Environmental Protection Agency (EPA) is responsible for administering the act. EPA establishes National Primary Drinking Water Regulations for contaminants that may cause adverse public health effects. These regulations set maximum contaminant levels and nonenforceable health goals (called Maximum Contaminant Level Goals) for recognized contaminants.

The SDWA does not regulate private wells that serve fewer than 25 people. However, the act does apply to all public water systems. A public water system is a system that provides water for public consumption that regularly serves at least 25 people or has at least 15 service connections. This includes facilities such as resorts and marinas.

Clean Water Act

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the

integrity of wetlands. The act regulates discharges of pollutants into the waters of the United States. EPA is responsible for administering waste discharge permits under the National Pollutant Discharge Elimination System. M&I wastewater facilities that discharge effluent into surface waters are required to obtain National Pollutant Discharge Elimination System permits. Large and medium storm sewer systems also require a National Pollutant Discharge Elimination System permit. The stormwater permits often require implementation of a pollution prevention plan to prevent contaminants from reaching surface waters.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) is designed to provide "cradle to grave" control of hazardous waste by imposing management requirements on generators and transporters of hazardous wastes and on owners and operators of treatment, storage, and disposal facilities. The RCRA also applies to the management of nonhazardous solid waste through the municipal solid waste landfill. EPA is responsible for administering the RCRA.

Shasta-Trinity National Forest Land and Resource Management Plan

The STNF Land and Resource Management Plan (LRMP) identifies goals, standards, and guidelines related to utilities and service systems in the STNF. The following public services goals, standards, and guidelines related to the project area were excerpted from the LRMP (USFS 1995).

Facilities Goals

- Provide and maintain those administrative facilities that effectively and safely serve the public and USFS workforce.

Facilities Standards and Guidelines

- Manage, construct, and maintain buildings and administrative sites to meet applicable codes and to provide the necessary facilities to support resource management.

Lands Goals

- Provide for continued use and new development of hydroelectric facilities.

Lands, Special Uses Standards and Guidelines

- Do not approve special use applications if such use can reasonably be accommodated on private land.

- Bury new telephone lines and new or reconstructed power distribution lines less than 35 kV, unless:

  – Visual quality objectives (VQO) can be met without burying,

  – Geologic conditions make burying infeasible, and

  - Burying will produce greater long-term site disturbance.

Whiskeytown-Shasta-Trinity National Recreation Area Management Plan

- Road construction will be restricted to that which is compatible with the purpose of the NRA and to provide essential private land access.
- Road closures will be implemented as opportunities arise to decrease road density and associated wildlife disturbance.
- No additional roads will be constructed for timber harvest.
- Any timber harvest must be consistent with NRA goals and objectives.
- All developments and long-term activities in the NRA will be designed with the intent of meeting VQOs. Those objectives include areas designated as retention, partial retention, and modification.
- Management activities that can be seen from within developed recreation sites will meet a VQO of retention in the foreground and partial retention in the middle ground.
- Best management practices and soil quality standards apply to all management activities.
- Riparian reserve standards and guidelines apply to all management activities within riparian reserves.

U.S. Bureau of Land Management Resource Management Plans

The U.S. Department of the Interior, Bureau of Land Management (BLM) manages a number of public lands adjacent to the Sacramento River corridor downstream from Shasta Dam. The study area falls under two BLM districts (Northern California and Central California) and the resource management plans (RMP) of three BLM field offices: Redding, Ukiah, and Mother Lode (BLM 2006). The purpose of BLM's RMPs is to provide overall direction for managing and allocating public resources in each planning area. The RMP for the Redding field office designates utility corridors as all existing or occupied corridors delineated in BLM's Western Regional Corridor Study of 1986, with the exception of several avoidance areas that include portions of the Sacramento River Management Area. The RMP also states that no additional utility corridors will be permitted in the Sacramento River Management Area, except for a 2-acre aerial communications site on Inks Ridge (BLM 1993).

21.2.2 State

California Water Plan

The California Water Plan provides a framework for water supply planning for the state. It identifies and evaluates existing and proposed statewide demand,

water supply programs, and projects to address the state's water supply needs. DWR is responsible for the preparation of the California Water Plan and the management of the state's surface water and groundwater resources (DWR 2009). DWR also oversees California's SWP and the regulation and protection of dams, assists local agencies in preparing urban water management plans, and reviews the plans to ensure compliance with the Urban Water Management Act.

The State Water Resources Control Board (State Water Board) has broad authority over water rights and regulations for the state. The State Water Board and its nine regional water quality control boards administer water rights and enforce pollution control standards throughout the state. The State Water Board is responsible for granting water rights through an appropriation process following public hearings and requisite environmental review by applicants and responsible agencies. In granting water rights permits, the State Water Board must consider all beneficial uses, including water for downstream human and environmental needs.

Water suppliers must obtain a permit from the California Department of Public Health, Office of Drinking Water, for a community water system, defined as a "public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents of the area served by the system" (42 Code of Federal Regulations Section 300f).

Water Quality Control Plan for the Sacramento and San Joaquin River Basins

The *Water Quality Control Plan for the Sacramento and San Joaquin River Basins* (Basin Plan) provides guidance for wastewater and stormwater facilities and development that could affect water quality in the basins. Basin Plan objectives are incorporated into county and city general plans, zoning ordinances, building codes, and subdivision ordinances. The Central Valley Regional Water Quality Control Board is responsible for issuing and enforcing waste discharge requirements, including discharge prohibitions and user reuse requirements for wastewater reclamation projects.

Nonhazardous Solid Waste Disposal Standards

Title 14, Chapter 3, of the California Code of Regulations provides minimum standards for solid waste handling and disposal in California and pertains to nonhazardous solid waste management. The California Department of Resources Recycling and Recovery is a new department in the California Natural Resources Agency that administers the programs formerly managed by the California Integrated Waste Management Board, including the regulation of nonhazardous solid waste facilities in the state.

Hazardous Waste Control Act

The California Hazardous Waste Control Act governs hazardous waste management and cleanup in California (Health and Safety Code, Chapters 6.5–6.98). The act mirrors the RCRA and imposes a "cradle to grave" regulatory

system for handling hazardous waste in a manner that protects human health and the environment. County Environmental Health Departments and California Environmental Protection Agency Certified Unified Program Agencies assume responsibility for enforcing local hazardous waste reporting requirements. Sites that store, handle, or transport specified quantities of hazardous materials are inspected annually. The California Department of Toxic Substances Control, part of the California Environmental Protection Agency, regulates the generation, transportation, treatment, storage, and disposal of hazardous waste under the RCRA and the California Hazardous Waste Control Act.

California Public Utilities Code

The California Public Utilities Code has broad regulatory authority over public utilities in California, which include electrical utilities, mutual water companies, private energy producers, telephone corporations, and railroad corporations. The California Public Utilities Commission is the government body that administers the California Public Utilities Code. The California Public Utilities Commission issued General Order 95 to provide safety standards for construction of power transmission facilities. Furthermore, the California Public Utilities Commission issued General Order 131-D to provide rules related to the planning and construction of electrical generation and transmission/power/distribution line facilities.

21.2.3 Regional and Local

City and County General Plans

The general plans for the counties and cities in the primary and extended study areas contain policies regarding utilities and services systems. Water supply, wastewater treatment, solid waste disposal, and utilities are subjects covered in the general plans and are considered essential public services required by all types and densities of development.

21.3 Environmental Consequences and Mitigation Measures

21.3.1 Methods and Assumptions

Evaluation of potential utility and services system impacts was based on a review of planning documents pertaining to the primary and extended study areas, including the STNF LRMP, California Department of Toxic Substances Control databases, and the general plans for the Cities of Redding and Red Bluff, the City of Shasta Lake, and Shasta and Tehama counties. The analysis also uses an inventory of utilities and service system infrastructure in the primary study area as it relates to the SLWRI.

Effects on water supply in the Shasta Lake and vicinity portion of the primary study area were evaluated based on construction and operational activities that would result from project implementation. It was generally assumed that construction activities associated with modifying Shasta Dam could result in

short-term effects on the delivery of local water supplies if the surface elevation of the reservoir were lowered to accommodate construction. A long-term effect would result if project operation would create a substantial disruption or reduction in the distribution or quantity of water supply.

Impacts on utilities and service systems were evaluated based on the duration and extent to which such services would be affected, as well as the ability of the service provider to continue to provide a level of service that could meet the needs of the public. The evaluation compares the duration of the effect with the service provided, taking into account the ability of the provider to maintain necessary services through alternative means.

Due to the higher cost and increased environmental impacts associated with relocating the utility lines to new rights-of-way, it is assumed that the transmission lines will generally remain along their current alignments. The installation of temporary lines would be required for some facility relocations to maintain operation of the lines during construction.

21.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with NEPA must consider the context and intensity of the environmental effects that would be caused by, or result from, the proposed action. Under NEPA, the significance of an effect is used solely to determine whether an EIS must be prepared. An environmental document prepared to comply with CEQA must identify the potentially significant environmental effects of a proposed project. A "[s]ignificant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project (State CEQA Guidelines, Section 15382). CEQA also requires that the environmental document propose feasible measures to avoid or substantially reduce significant environmental effects (State CEQA Guidelines, Section 15126.4(a)).

The following significance criteria were developed based on guidance provided by State CEQA Guidelines and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative related to utilities and service systems would be significant if project implementation would do any of the following:

- Not comply with published local, State, or Federal statutes, regulations, or standards relating to solid waste
- Exceed permitted landfill capacity with waste generated by the project
- Degrade the level of service of a public utility or services system
- Require relocating utility infrastructure

- Exceed wastewater treatment requirements of the applicable regional water quality control board
- Exceed water supplies available to service the project from existing entitlements and resources, such that new or expanded entitlements would be needed
- Disrupt utilities service to create a public health hazard or extended service disruption
- Require substantial improvements to the infrastructure or level of staffing of a utility or services system to maintain its existing level of service
- Require or result in the construction of new water treatment, wastewater treatment, or stormwater drainage facilities, or the expansion of such existing facilities, the construction of which could cause significant environmental effects

21.3.3 Topics Eliminated from Further Consideration

The action alternatives would increase availability of water supply for water users on the Sacramento River and Delta. Increased water supplies might increase demand for new or expanded WWTPs that discharge to the Sacramento River or Delta. The State Water Board has review, approval, and permitting authority over operation of new or expanded WWTPs, and the environmental effects of approving WWTPs must be evaluated under CEQA. If approved, WWTPs must operate within the limits established in the waste discharge requirements issued by the State Water Board. Although increased water supplies might increase demand for new or expanded WWTPs that discharge to the Sacramento River or Delta, it is speculative to assume that the State Water Board would approve new or expanded WWTPs. Therefore, increased discharge of treated wastewater into the Sacramento River or Delta that is not currently authorized as a result of this project (and that has not already been evaluated under CEQA) is not reasonably foreseeable and is eliminated from further consideration.

21.3.4 Direct and Indirect Effects

Utilities and service system impacts in the primary study area – Shasta Lake and vicinity and upper Sacramento River (Shasta Dam to Red Bluff) – caused by project construction and operation are described below. Only minimal, if any, project-related impacts on utilities and service systems are expected to occur downstream from the Red Bluff Pumping Plant or in the remainder of the extended study area.

No-Action Alternative

Shasta Lake and Vicinity, Upper Sacramento River (Shasta Dam to Red Bluff), Lower Sacramento and Delta, and CVP/SWP Service Areas The

impact discussion for the No-Action Alternative addresses all of both the primary and extended study areas together, because this alternative would not affect utilities in either the primary or extended study area.

Impact Util-1 (No-Action): Damage to or Disruption of Public Utility and Service Systems Infrastructure Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no damage to public utilities infrastructure or temporary disruption of services in the vicinity of Shasta Lake would occur from implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-2 (No-Action): Utility Infrastructure Relocation or Modification Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, relocation or modification of existing utilities infrastructure in the vicinity of Shasta Lake would not occur from implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-3 (No-Action): Short-Term Increase in Solid Waste Generation Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no solid waste would be generated as a result of implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-4 (No-Action): Increases in Solid Waste Generation from Increased Recreational Opportunities Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, no solid waste associated with increased recreational opportunities would be generated as a result of implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

Impact Util-5 (No-Action): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Under the No-Action Alternative, no new facilities would be constructed and no existing facilities would be altered, expanded, or demolished. Therefore, increased demand for water treatment and distribution facilities related to increases in water supply would not occur from implementing the No-Action Alternative. No impact would occur. Mitigation is not required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

Utilities and service systems impacts would occur primarily in the Shasta Lake and vicinity portion of the primary study area. The majority of impacts

identified would be short-term impacts resulting from the abandonment and relocation of utilities and service systems. Individual utilities or service systems are discussed where project detail is available. However, stormwater, wastewater, solid waste management, and water supply systems are also referred to as service systems when a general reference to all of the systems would be appropriate; and electrical service and infrastructure, natural gas service and infrastructure, and telecommunications service and infrastructure are referred to as utilities when a general reference to all of the utilities would be appropriate.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP1 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP1): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project construction activities could damage public utility and service systems infrastructure, which could result in short-term disruptions of service. Construction activities would occur in areas proposed for utilities or service systems abandonment and relocation. Project implementation could require disruption of public utilities or service systems to accommodate construction activity. This impact would be potentially significant.

The quantity of utility and service systems infrastructure relocation varies for the developed areas in the general vicinity of Shasta Lake. The bulk of the work would be done along the shores of the Sacramento Arm, the most developed portion of Shasta Lake. Utility abandonment and relocation would take approximately 4.5 years. Some service systems construction would occur in the upper Sacramento River portion of the primary study area, primarily at the Shasta Dam compound. Disruptions of utilities service in the upper Sacramento River area could result from project implementation and are discussed below.

Project construction activities associated with abandonment and relocation of utilities and service systems infrastructure could damage existing public utility lines. Excavation activities, vegetation clearing, and heavy equipment operations could accidentally damage utility lines or service system pipes/ditches, which could result in a disruption of public utilities or service systems.

Reclamation inventoried utilities and service systems on lands surrounding Shasta Lake that could be inundated by an increased reservoir elevation. Based on Reclamation's inventory, a 6.5-foot raise in the level of Shasta Lake would require abandonment and relocation of approximately 31,000 feet (5.8 miles) of power lines and 33,000 feet (6.2 miles) of telecommunications lines. Power and telecommunications facilities that could be inundated and that would require relocation include transmission towers, power poles, underground power and telecommunications lines, above-ground power and telecommunications lines,

and cable lines. Approximately 20 percent of the power transmission facilities that could be inundated would consist of high-voltage power lines; the remaining 80 percent would consist of low-voltage power lines. Numerous individual on-site wastewater systems and stormwater systems (primarily adjacent to roads) would be relocated to areas that would not be affected under CP1 (Figure 21-2). The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the utilities in the ancillary areas that would need to be demolished or relocated (Reclamation 2007).

Disruptions in services resulting from damage to utility lines would likely be localized because the majority of power and telecommunication lines that would require relocation serve the local population around Shasta Lake. Reclamation or project contractors would likely repair potential infrastructure damage immediately after discovery of the damage. Therefore, disruptions of public utilities in the Shasta Lake and vicinity portion of the primary study area would not continue for extended periods of time. However, periodic service disruptions could occur throughout the 4.5-year construction period for CP1, which could inconvenience the local population.

Project construction activities associated with raising Shasta Dam could damage existing public utilities infrastructure and result in disruptions of public utilities service in the primary study area. Activities that could damage public utilities at the dam and result in disruptions of service include drilling activities, heavy equipment operations, and other worksite accidents. As explained above, infrastructure damage would be repaired immediately. If hydropower generation is interrupted at Shasta Dam, repair time could be extended and there would be prolonged impacts on the upper Sacramento River portion of the primary study area.

Public utilities or service systems could be disrupted during construction activities that require a temporary shut-off for safety or mechanical purposes. This effect would be most likely to occur in the Shasta Lake and vicinity portion of the primary study area because of the amount of project construction in that area relating to local utilities and service systems relocation activities. Public utilities and service systems would be relocated such that they would be functional by project completion. Occasional disruptions of public utilities could also occur in the upper Sacramento River area because of construction activities at Shasta Dam that require temporary power outages. Construction activities in the immediate vicinity of the Shasta Dam compound could occasionally affect the treatment and delivery of water to the City of Shasta Lake. This impact would be short term and would continue intermittently until project construction activities were completed. Construction would take approximately 4.5 years.

To minimize potential disruption of service and damage to the utilities and service systems infrastructure, project contractors would follow local, State, and Federal regulations pertaining to utilities and service systems location and

construction. However, the magnitude of the project and number of utilities and service systems requiring relocation make it likely that utilities or service systems could be damaged or services disrupted. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP1): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, air quality, water quality, and utilities service. This impact would be potentially significant.

In general, short-term impacts that could result from relocation of utilities infrastructure would be localized (Shasta Lake and vicinity) and could include disruptions caused by noise, traffic, and dust associated with construction activities. Relocation of utilities infrastructure could result in localized long-term impacts related to visual quality, land use, vegetation, transportation, water quality, air quality, noise, and wildlife in the Shasta Lake and vicinity portion of the primary study area; these impacts are discussed in separate EIS chapters. Some utilities infrastructure would also be modified in the upper Sacramento River portion of the primary study area, particularly in the general vicinity of the Shasta Dam compound.

As discussed in Impact Util-1 (CP1), project construction and operation would result in relocation and/or modification of utilities infrastructure at Shasta Dam and in communities in the Shasta Lake and vicinity portion of the primary study area (Figures 21-1 and 21-2). The infrastructure components include water and wastewater service and electrical infrastructure, telephone lines, and cable lines. Proposed infrastructure relocation was based on (1) whether utilities components would be inundated by an increased lake elevation and (2) whether the inundation would warrant relocation or permanent abandonment.

The largest potentially affected residential developments near Shasta Lake are in the Lakeshore and Sugarloaf areas. Recreational facilities (e.g., campgrounds and marinas) would also change substantially. The quantity of services and utilities infrastructure reconstruction would vary around Shasta Lake with an emphasis on the Sacramento, McCloud, and Pit arms as well as the Main Body. Abandonment and relocation of utilities infrastructure would take 4.5 years. The Utilities and Miscellaneous Minor Infrastructure Technical Memorandum shows detailed maps of the utilities in the ancillary areas that would need to be demolished or relocated (Reclamation 2007).

Consistent with Shasta County Development Standards, septic systems within 200 feet of the new full pool waterline or 100 feet downslope of the new full pool waterline would be demolished. Wastewater pipes, septic tanks, vaults/pits, and leachfields would be abandoned in place, and restroom buildings and contents would be removed and taken to an approved landfill. Relocation of

septic systems in the project area would be done in one of two ways: (1) construct new septic systems on the property of the affected home or facility, where feasible; or (2) define a possible localized WWTP alternative for homes that do not meet Shasta County requirements for septic system separation from the lake. The general WWTP would include a pressurized sewer collection system to transport wastewater flows to several centralized package WWTPs. Localized WWTPs would likely be constructed to serve the areas of Salt Creek, Sugarloaf/Tsasdi Resort, Lakeshore (possibly several plants), Antlers Campground, Campbell Creek Cove, Bridge Bay Marina, Silverthorn Resort, and Jones Valley.

WWTP operation can result in undesirable environmental effects. For example, discharge of treated wastewater could affect the water quality of Shasta Lake, pump stations could generate unwanted noise, and the treatment process could generate undesirable odors. The environmental impacts of constructing and operating wastewater treatment facilities are evaluated in the pertinent technical chapters of the EIS.

Power lines and telecommunications lines usually follow parallel alignment and typically use the same power pole. Some of the utility lines serving individual houses, businesses, government facilities, and cabins are routed underground. All transmission towers, power poles, underground power lines, and telecommunications lines that would be inundated under CP1 would need to be removed and relocated.

Low-voltage power lines, telecommunications lines, or power poles located within 50 feet of the CP1 maximum lake elevation would be considered threatened by inundation, and high-voltage power lines and towers located within 100 feet would be considered inundated. Relocation of utilities infrastructure would be consistent with applicable local, State, and Federal requirements.

CP1 would inundate 31,000 feet (approximately 5.8 miles) of power lines and 33,000 feet (about 6.2 miles) of telecommunications lines near Shasta Lake. All associated transmission towers, power poles, underground power lines, telecommunications lines, and cable lines that would be inundated under CP1 would need to be removed and relocated.

Relocation of infrastructure would include vegetation removal, which would result in project impacts. Clearing of vegetation would be required to provide space for utilities structures and to create a safety buffer. Reclamation would clear the appropriate space for utilities infrastructure as provided by local, State, and Federal regulations. Additional space could be cleared to provide the highest level of safety for project operation and maintenance. In addition, Reclamation would apply the National Electric Safety Code, a voluntary safety code followed by the utilities industry, to ensure that relocated infrastructure would operate as safely or safer than existing utilities. Widths of vegetation

clearance would range from 40 to 75 feet. Cleared areas could be wider, depending on site-specific conditions, such as on steep slopes or when tall trees are nearby.

Impacts resulting from vegetation clearing associated with relocation of utilities infrastructure would be minimized where possible. When possible, Reclamation would locate utility corridors in sites that are not heavily forested to minimize vegetation clearing. Where heavily forested areas cannot be avoided for relocation of utilities infrastructure, Reclamation would coordinate vegetation removal with USFS and other landowners/managers to minimize impacts. Reclamation will consider co-locating and undergrounding relocated utility lines to the extent practicable.

Relocation of utilities infrastructure would require additional roads for construction and maintenance of the new facilities. Roads would be constructed in the rights-of-way of the cleared utility lines and would be constructed according to the appropriate jurisdiction's standards (i.e., USFS or Shasta County). New roads serving relocated utilities infrastructure would be located and designed to prevent erosion and avoid geologic hazards.

As discussed in Chapter 20, "Transportation and Traffic," some work in the road relocation areas could require a road closure with detours, lane closures, or a combination of both. Road closures would temporarily impede access to local connector roads and recreational land uses, affecting residents, local recreational and nonrecreational businesses, and visitors to Shasta Lake.

To minimize potential impacts resulting from relocation of utilities infrastructure, Reclamation and project contractors would follow local, State, and Federal regulations pertaining to installation of utilities infrastructure, the STNF LRMP standards and guidelines, and the *Shasta County General Plan* and zoning guidance. Before vacating a street or public service easement, the Shasta County Board of Supervisors must consider applicable consistency with the general plan. Shasta County Streets and Highways Code Section 8313 and California Public Utilities Code Section 12808.5 require cities and counties approving electrical transmission and distribution lines of municipal utilities districts to make a finding concerning the consistency of the lines with the general plan.

Reclamation is committed to funding the demolition and relocation of existing infrastructure and construction of replacement infrastructure, including localized WWTPs that might replace some individual septic systems. Reclamation is also committed to facilitating establishment of community services districts and transferring plant ownership to the districts, which would be responsible for long-term operation and management.

Project implementation would result in relocation or modification of utilities infrastructure. The extent of relocation of utilities infrastructure and/or

modification that would be necessary could result in short-term impacts on noise, traffic, and utilities services; and project implementation could result in long-term impacts on land use, wildlife, water quality, and soils. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP1): Short-Term Increase in Solid Waste Generation Project implementation would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

Demolition and construction activities would generate waste materials, including concrete, metal, and other materials from the dam renovation; structural metal, concrete, and wood from demolished bridges and buildings; concrete and asphalt from relocated boat launch facilities; unusable recreation equipment from relocated campgrounds and picnic areas; cables, pumps, wiring, and power towers from utility relocations; and scrap material generated as a byproduct of construction. Demolition and construction waste for CP1 would total about 176,627 cubic yards. Reclamation's contractors would take measures to recycle or reuse demolished materials, such as steel or copper wire, where practical. Therefore, some of the demolition and construction waste would be brought to nearby recycling facilities. Hazardous materials (e.g., asbestos, if found) would be brought to an approved hazardous waste landfill for disposal. Much of the underground utilities and service systems proposed for abandonment would be abandoned in place and would not be removed to a landfill or recycling facility.

Table 21-1 provides a summary of project-generated solid waste for the action alternatives.

Table 21-1. Waste Generated by Project Construction

Feature	Estimated Volume (cubic yards)		
	CP1	CP2	CP3, CP4, CP4A, CP5
Vehicle bridge replacements	10,700	10,700	10,700
Doney Creek UPRR bridge replacement	4,718	4,718	4,847
Sacramento River UPRR second crossing	15,558	15,558	15,558
Pit River Bridge piers 3 and 4 protection	0	0	0
Railroad realignment	2,420	2,420	2,420
Major road relocations	10,980	20,659	23,516
Reservoir area utilities (removals/relocations)	1,364	3,251	4,847
Reservoir area recreation (removals/relocations)	99,240	102,076	132,624
Main dam	2,263	1,553	1,553
Outlet works	388	388	388
Spillway	18,305	16,590	12,765
Temperature control device modification	20	20	20
Powerplant and penstocks	0	0	0
Right wing dam	531	511	511
Left wing dam	8,630	8,630	8,630
Visitor Center replacement	1,510	1,510	1,510
Reservoir area dikes	0	0	0
Pit 7 modifications	0	0	0
Total	176,627	188,584	219,889

Key:
CP = Comprehensive Plan
UPRR = Union Pacific Railroad

Two landfills are currently operational in Shasta County: the West Central Landfill and the Anderson Landfill. The West Central Landfill, in the city of Redding, is the closest facility to Shasta Dam and would likely receive the majority of solid waste generated during construction. This landfill has sufficient permitted capacity to accommodate solid waste disposal needs during construction of the project. CP1 would generate roughly 176,627 cubic yards of solid waste; the West Central Landfill has a remaining capacity of approximately 5 million cubic yards, and the Anderson Landfill has a remaining capacity of approximately 11 million cubic yards. Recycling of demolition and construction waste materials would further reduce the volume of waste disposed at landfills.

Three commercial hazardous waste landfills operate in Southern California. Utilities poles, materials containing asbestos or lead-based paints, and transformers containing polychlorinated biphenyls would be sent to one of these landfills or to another EPA-permitted hazardous waste facility.

Solid waste generation by the project would be a short-term impact. Furthermore, accepting the project waste would not impair solid waste facilities that would serve the project. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP1): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant.

Implementation of the project could increase and enhance recreational opportunities in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River. Additional recreationists could incrementally increase the amount of solid waste generated. Multiple landfills, including the West Central Landfill, the Anderson Landfill, and the Tehama County/Red Bluff Landfill, are located in the project region and have a substantial amount of available capacity. Private transfer stations are located throughout the region as well. These multiple facilities have adequate capacity for disposal of solid waste generated by implementation of the project (CIWMB 2008). Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP1): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply It is reasonable to assume that the increased water supply expected under this alternative would increase demand for construction and operation of water treatment and distribution facilities within the CVP service area. No information is currently available about future water facilities that might be built in response to the expected increase in water supply. Therefore, it is not possible to evaluate the environmental effects of building and operating such facilities. Such an evaluation would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP1): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities during construction in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP1): Utility Infrastructure Relocation or Modification
Construction would not occur outside of the primary study area; therefore, there

would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP1): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from construction activities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP1): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP1): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply It is reasonable to assume that the increased water supply expected under this alternative would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. No information is currently available about future water facilities that might be built in response to the expected increase in water supply. Therefore, it is not possible to evaluate the environmental effects of building and operating such facilities. Such an evaluation would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP2 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP2): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for abandonment of utilities or service systems, and implementation of relocation projects could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant.

This impact would be similar to Impact Util-1 (CP1). An increase in the height of the dam could result in a larger area of inundation and additional infrastructure and service systems construction activities. Construction activities for CP2 would take longer than for CP1 and would extend the duration of impacts resulting from CP2. CP2 would require the relocation of approximately 5,000 more feet of power lines and about 3,000 more feet of telecommunications lines, and would take approximately 6 more months than CP1. Additional service systems would need to be demolished and/or relocated for CP2.

Project implementation could damage public utilities and service systems infrastructure, or result in short-term disruption of utilities and service systems service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP2): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. This impact would be potentially significant.

This impact would be similar to Impact Util-2 (CP1). An increase in the height of the dam could result in a larger area of inundation, which would result in additional relocation or modification of utilities infrastructure compared to Impact Util-1 (CP1). Construction activities for CP2 would take longer than for CP1 and would extend the duration of impacts resulting from CP2. CP2 would require the relocation of approximately 5,000 more feet of power lines and associated transmission facilities and relocation of about 3,000 more feet of telecommunications lines and associated facilities, and would take approximately 6 more months than CP1. Additional vegetation clearing would also be required to accommodate relocation of infrastructure.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utilities service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP2): Short-Term Increase in Solid Waste Generation Project implementation would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

This impact would be similar to Impact Util-3 (CP1). An increase in the height of the dam would result in a larger area of inundation, which could result in a greater potential for generation of construction waste materials compared to Impact Util-1 (CP1). CP2 would generate roughly 188,584 cubic yards of solid

waste (see Table 21-1). Similar to CP1, the anticipated increase in the amount of solid waste generated during construction of this alternative would still be sufficiently handled by the three local landfills and permitted hazardous waste landfills. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP2): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant.

This impact would be similar to Impact Util-4 (CP1). An increase in the height of the dam could result in a larger area of inundation, which could result in more recreationists and greater potential for generation of solid waste materials than with Impact Util-1 (CP1). The anticipated increase in the amount of construction waste generated during long-term operation of this alternative is expected to be sufficiently handled by the three local landfills, which have a substantial amount of available capacity. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP2): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP2 would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP2): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service during construction in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP2): Utility Infrastructure Relocation or Modification
Construction would not occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP2): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from construction activities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP2): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP2): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP2 would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply and Anadromous Fish Survival

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP3 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP3): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for abandonment and relocation of utilities or service systems. Project implementation could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant.

This impact would be similar to Impact Util-1 (CP1). An increase in the height of the dam could result in a larger area of inundation and additional infrastructure and service systems construction activities. Construction activities for CP3 would take longer than for CP1 and would extend the duration of impacts resulting from CP3. CP3 would require the relocation of approximately 8,000 more feet of power lines and about 6,000 more feet of telecommunications lines and would take approximately 6 more months than

CP1. Additional service systems would need to be demolished and/or relocated for CP3 to prevent inundation.

Project implementation could damage public utility and service systems infrastructure, or result in short-term disruption of utility and service systems service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP3): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utility infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. This impact would be potentially significant.

This impact would be similar to Impact Util-2 (CP1). An increase in the height of the dam could result in a larger area of inundation, which would result in additional relocation or modification of utility infrastructure compared to Impact Util-1 (CP1). Construction activities for CP3 would take longer than for CP1 and would extend the duration of impacts resulting from CP3. CP3 would require the relocation of approximately 8,000 more feet of power lines and associated transmission facilities and about 6,000 more feet of telecommunications lines and associated facilities; CP3 would take approximately 6 more months than CP1 to implement. Additional vegetation clearing would also be required to accommodate infrastructure relocation.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP3): Short-Term Increase in Solid Waste Generation Project implementation would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

This impact would be similar to Impact Util-3 (CP1). An increase in the height of the dam would result in a larger area of inundation, which could result in a greater potential for generation of construction waste materials compared to Impact Util-1 (CP1). CP3 would generate roughly 219,889 cubic yards of solid waste (see Table 21-1). Similar to CP1, the anticipated increase in the amount of solid waste generated during construction of this alternative would still be sufficiently handled by the three local landfills and permitted hazardous waste landfills. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP3): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, creating incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

This impact would be similar to Impact Util-4 (CP1). An increase in the height of the dam could result in a larger area of inundation, which could result in more recreationists and greater potential for generation of solid waste materials compared to Impact Util-1 (CP1). The anticipated increase in the amount of solid waste generated during long-term operation of this alternative would be handled by the three local landfills and permitted hazardous waste landfills. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP3): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP3 would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta/CVP/SWP Service Areas

Impact Util-6 (CP3): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service during construction in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP3): Utility Infrastructure Relocation or Modification
Construction would not occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP3): Short-Term Increase in Solid Waste Generation
Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation from construction activities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP3): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP3): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP3 would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP4 and CP4A addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP4 and CP4A): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation, including gravel augmentation and habitat restoration activities along the upper Sacramento River, could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for utilities or service systems abandonment and relocation. Project implementation could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact Util-1 (CP1). The greater increase in the height of the dam for CP4 or CP4A would result in a larger area of inundation and additional infrastructure and service systems construction activities. Construction activities for CP4 or CP4A would take longer than for CP1 and would extend the duration of impacts resulting from CP4 or CP4A. CP4 or CP4A would require the relocation of approximately 8,000 more feet of power lines and about 6,000 more feet of telecommunications lines and would take approximately 6 more months than CP1. Additional service systems would need to be demolished and/or relocated for CP4 or CP4A to prevent inundation.

Project implementation could damage public utility and service systems infrastructure, or result in short-term disruption of utility and service systems service. Therefore, this impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 21.3.5.

Project implementation could damage public utility and service systems infrastructure, or result in short-term disruption of utility and service systems service. Therefore, this impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP4 and CP4A): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Gravel augmentation and habitat restoration activities along the upper Sacramento River might also require relocation or modification of utilities infrastructure. This impact would be potentially significant for CP4 or CP4A.

This impact would be similar to Impact Util-2 (CP1). The greater increase in the height of the dam for CP4 or CP4A would result in a larger area of inundation, which would result in additional relocation or modification of utility infrastructure compared to Impact Util-1 (CP1). Construction activities for CP4 or CP4A would take longer than for CP1 and would extend the duration of impacts resulting from CP4 or CP4A. This would require the relocation of approximately 8,000 more feet of power lines and associated transmission facilities and about 6,000 more feet of telecommunications lines and associated facilities; CP4 or CP4A would take approximately 6 more months than CP1 to implement. Additional vegetation clearing would also be required to accommodate infrastructure relocation.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Therefore, this impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 21.3.5.

Project implementation could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Therefore, this impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP4 and CP4A): Short-Term Increase in Solid Waste Generation Project implementation, including gravel augmentation and habitat restoration activities along the upper Sacramento River, would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant for CP4 or CP4A.

This impact would be similar to Impact Util-3 (CP3), with a very slight increase in solid waste generation related to downstream restoration construction activities.

Therefore, this impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Therefore, this impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP4 and CP4A): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from project implementation. Therefore, this impact would be less than significant for CP4 or CP4A.

This impact would be similar to Impact Util-4 (CP1). The greater increase in the height of the dam would result in a larger area of inundation, which could result in more recreationists and greater potential for generation of solid waste materials compared to Impact Util-1 (CP1). The anticipated increase in the amount of solid waste generated during long-term operation of this alternative would be handled by the three local landfills and permitted hazardous waste landfills.

This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP4 and CP4A): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP4 or CP4A would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration for CP4 or CP4A and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP4 and CP4A): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP4 and CP4A): Utility Infrastructure Relocation or Modification No utility infrastructure relocation or modification would occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP4 and CP4A): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP4 and CP4A): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities resulting from project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area.

No impact would occur for CP4. Mitigation for this impact is not needed, and thus not proposed.

No impact would occur for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP4 and CP4A): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP4 or CP4A would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration for CP4 or CP4A and is, therefore, not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff) The impact discussion for CP5 addresses the Shasta Lake and vicinity and upper Sacramento River portions of the primary study area together, because impacts from construction activities would affect both areas.

Impact Util-1 (CP5): Damage to or Disruption of Public Utility and Service Systems Infrastructure Project implementation, including gravel augmentation and the habitat restoration activities along the upper Sacramento River, could damage public utilities and service systems infrastructure, which could result in short-term disruptions of service. The potential exists for construction activities to damage or interfere with utilities and service systems infrastructure, and thus service, during construction operations. Construction activities would occur in areas proposed for abandonment and relocation of utilities or service systems. Project implementation could require disruption of public utilities or services to accommodate construction activity. This impact would be potentially significant.

This impact would be similar to Impact Util-1 (CP1) and identical to Impact Util-1 (CP4 and CP4A). Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-2 (CP5): Utility Infrastructure Relocation or Modification Project implementation would require relocation or modification of utilities infrastructure, which could result in localized impacts on vegetation, land use, transportation, wildlife, noise, water quality, and utility service. Gravel augmentation and the habitat restoration activities along the upper Sacramento River might also require relocation or modification of utilities infrastructure. This impact would be potentially significant.

This impact would be similar to Impact Util-2 (CP1) and identical to Impact Util-2 (CP4 and CP4A). Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 21.3.5.

Impact Util-3 (CP5): Short-Term Increase in Solid Waste Generation Project implementation, including gravel augmentation and habitat restoration activities along the upper Sacramento River, would result in a short-term increase of solid waste generation during construction activities. The project would not generate construction waste materials that would exceed the capacity of local landfills. This impact would be less than significant.

This impact would be similar to Impact Util-3 (CP4 and CP4A), with a very slight increase in solid waste generation related to enhancement of tributary and warm-water habitat and recreational trails. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-4 (CP5): Increases in Solid Waste Generation from Increased Recreational Opportunities Project implementation could result in more recreationists in and around Shasta Lake, on streams near Shasta Lake, and along the upper Sacramento River, which could cause incremental increases in the amount of solid waste generated. However, multiple landfills are located throughout the region with adequate capacity for disposal of solid waste generated from implementation of the project. Therefore, this impact would be less than significant.

This impact would be similar to Impact Util-4 (CP1) and identical to Impact Util-4 (CP4 and CP4A). Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-5 (CP5): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP5 would increase demand for construction and operation of water treatment and distribution facilities. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact Util-6 (CP5): Damage to or Disruption of Public Utility and Service Systems Infrastructure Construction would not occur outside of the primary study area; therefore, there would be no temporary disruption of utilities service in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-7 (CP5): Utility Infrastructure Relocation or Modification No utility infrastructure relocation or modification would occur outside of the primary study area; therefore, there would be no relocation or modification of utilities infrastructure in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-8 (CP5): Short-Term Increase in Solid Waste Generation Construction would not occur outside of the primary study area; therefore, there would be no increases in solid waste generation in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-9 (CP5): Increases in Solid Waste Generation from Increased Recreational Opportunities Increased recreational opportunities caused by project implementation would occur only in the primary study area; therefore, there would be no increases in solid waste generation from increased recreational opportunities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact Util-10 (CP5): Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply Similar to CP1, it is reasonable to assume that the increased water supply expected under CP5 would increase demand for construction and operation of water treatment and distribution facilities within the extended study area. However, evaluation of the environmental effects of building and operating such facilities would be too speculative for meaningful consideration and, therefore, is not provided in this document. Mitigation for this impact is not needed, and thus not proposed.

21.3.5 Mitigation Measures

Table 21-2 presents a summary of mitigation measures for utilities and service systems.

Table 21-2. Summary of Mitigation Measures for Utilities and Service Systems

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Util-1: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Util-2: Utility Infrastructure Relocation or Modification (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Util-3: Short-Term Increase in Solid Waste Generation (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact Util-4: Increases in Solid Waste Generation from Increased Recreational Opportunities (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 21-2. Summary of Mitigation Measures for Utilities and Service Systems (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/CP4A	CP5
Impact Util-5: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	TS	TS	TS	TS	TS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	NI	TS	TS	TS	TS	TS
Impact Util-6: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-7: Utility Infrastructure Relocation or Modification (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-8: Short-Term Increase in Solid Waste Generation (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-9: Increases in Solid Waste Generation from) Increased Recreational Opportunities (Lower Sacramento River, Delta, CVP/SWP Service Areas	LOS before Mitigation	N/A	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	NI	NI	NI	NI	NI
Impact Util-10: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	N/A	TS	TS	TS	TS	TS
	Mitigation Measure	None required.	None needed; thus none proposed.				
	LOS after Mitigation	N/A	TS	TS	TS	TS	TS

Key:
B = beneficial
LOS = level of significance
LTS = less than significant
N/A = not applicable
NI = no impact
PS = potentially significant
S = significant

No-Action Alternative

No mitigation is required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts Util-3 (CP1) through Util-10 (CP1). Mitigation is provided below for other impacts of CP1 on utilities and service systems.

Mitigation Measure Util-1 (CP1): Implement Procedures to Avoid Damage to or Temporary Disruption of Service To avoid temporary disruption of service, the following measures will be implemented during project construction to ensure that existing utilities infrastructure is not damaged:

- **Permits** – Reclamation will obtain utilities excavation or encroachment permits as necessary before initiating any work with potential to affect utility lines and will include all necessary permit terms in construction contract specifications.

- **Locating Line** – Utility locations will be identified through field surveys and the use of the Underground Service Alert services. Any buried utility lines will be clearly marked before initiation of any ground-disturbing construction activity.

- **Clearing Right-of-Way and Road Access** – If necessary, infrastructure will be removed or reinforced in coordination with all potential service providers known to have, or potentially having, utilities infrastructure in the project area.

- **Response Plan** – The construction contractor will prepare a response plan to address potential accidental damage to utility lines before the start of construction. The plan will identify chain of command rules for notification of authorities and affected businesses and will identify appropriate actions and responsibilities to ensure the safety of the public and workers. The response plan will be circulated to the potentially affected service system providers for review and approval before the start of construction activities. Worker education training in response to such situations will be conducted by the contractor.

Implementation of this mitigation measure would reduce Impact Util-1 (CP1) to a less-than-significant level.

Mitigation Measure Util-2 (CP1): Adopt Measures to Minimize Infrastructure Relocation Impacts For each segment of a utility line that would need to be relocated or modified as a result of project construction and operations, the following measures will be implemented:

- **Permits** – Reclamation will obtain utilities excavation or encroachment permits as necessary before initiating any work associated with modification or relocation of an existing utility line and will include all necessary permit terms in construction contract specifications.

- **Locating and Staking Line** – Locations for relocated utility lines will be identified in coordination with affected service providers. Reclamation will consider co-locating and undergrounding relocated utility lines to the extent practicable. As part of this effort, field surveys will be conducted and the Underground Service Alert services will be used to ensure that there are no conflicts with other existing utility lines. After the alignment of the line has been finalized, a survey will be made to map the route of the line. The results of the survey will be plan and profile drawings, which will be used to spot the poles. After exact positions have been fixed, a stake will be driven to indicate the center of the structure or pole.

- **Clearing Right-of-Way and Road Access** – The right-of-way will be cleared of all obstructions that will interfere with the operation of the power line. A strip of land will be cleared on each side of the centerline of the transmission line by cutting or trimming the trees and brush. All trees and brush should be cut 3 inches or less from the ground line so that the passage of trucks and tractors will not be hindered. The cut trees and brush will be disposed of by chipping or spreading, burning, or hauling away. Disposal of the debris by burning, or otherwise, will be accomplished in accordance with State and local laws and regulations without creating a hazard or nuisance. The right-of-way should be treated with chemical spray to retard the growth of brush or trees that could endanger the operation of the transmission line.

- **Installing Pole Footings and Foundations** – Pole sites will be properly graded in accordance with the specifications. Usually the slope of the grade will not be more than 3:1. All topsoil should be removed before grading the pole location.

- **Utilities Modification Plan** – The construction contractor will prepare a utilities modification and relocation plan before the start of construction. The plan will identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the safety of the public and workers and include a description of how utilities infrastructure will be modified or relocated and identification of precise alignment where utility lines will be relocated. The plan will be circulated to the potentially affected service system providers for review and approval before the start of construction activities. Worker education training in response to such situations will be conducted by the contractor.

- The contractor will stage utility line modifications and relocations in a manner that minimizes interruption of service.

- In accordance with the STNF LRMP, relocated power lines less than 35 kV and telephone lines on USFS land within the STNF will be buried unless the STNF VQO can be met without burying, geologic conditions make burying infeasible, or burying will produce greater long-term site disturbance.

- **Traffic Control and Safety Assurance Plan** – Reclamation will implement Mitigation Measure Trans-1 as described in EIS Chapter 20, "Transportation and Traffic," to reduce adverse effects of road closures and detours or partial road closures on access to local streets and adjacent uses.

Implementation of this mitigation measure would reduce Impact Util-2 (CP1) to a less-than-significant level.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts Util-3 (CP2) through Util-10 (CP2). Mitigation is provided below for other impacts of CP2 on utilities and service systems.

Mitigation Measure Util-1 (CP2): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP2) to a less-than-significant level.

Mitigation Measure Util-2 (CP2): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP2) to a less-than-significant level.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply and Anadromous Fish Survival

No mitigation is required for Impacts Util-3 (CP3) through Util-10 (CP3). Mitigation is provided below for other impacts of CP3 on utilities and service systems.

Mitigation Measure Util-1 (CP3): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP3) to a less-than-significant level.

Mitigation Measure Util-2 (CP3): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to

Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP3) to a less-than-significant level.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is required for Impacts Util-3 (CP4 and CP4A) through Util-10 (CP4 and CP4A). Mitigation is provided below for other impacts of CP4 or CP4A on utilities and service systems.

Mitigation Measure Util-1 (CP4 and CP4A): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure Util-2 (CP4 and CP4A): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impacts Util-3 (CP5) through Util-10 (CP5). Mitigation is provided below for other impacts of CP5 on utilities and service systems.

Mitigation Measure Util-1 (CP5): Implement Procedures to Avoid Damage to or Temporary Disruption of Service This mitigation measure is identical to Mitigation Measure Util-1 (CP1). Implementation of this mitigation measure would reduce Impact Util-1 (CP5) to a less-than-significant level.

Mitigation Measure Util-2 (CP5): Adopt Measures to Minimize Infrastructure Relocation Impacts This mitigation measure is identical to Mitigation Measure Util-2 (CP1). Implementation of this mitigation measure would reduce Impact Util-2 (CP5) to a less-than-significant level.

21.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences,” gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, “Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area,” in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table

3-1 under Quantitative Analysis would have effects on utilities or service systems in the primary study area or have effects in extended study area that contribute to cumulative impacts of the SLWRI since no impacts have been identified in the extended study area. This analysis is based on the projects listed in Table 3-1 under Qualitative Analysis.

Past, present, and reasonably foreseeable future projects (see Table 3-1) would generate construction-related solid waste. Example projects in the Study Area include the Moody Quarry Flats, Mountain Gate at Shasta Mixed-Use Area Plan, and the Antlers Bridge Replacement. As discussed in Impact Util-3 (CP1–CP5), affected landfills have sufficient capacity to accommodate project-generated solid waste, and are also expected to have sufficient capacity to accommodate reasonably foreseeable development in addition to project waste. Therefore, none of the action alternatives would contribute to cumulative effects related to solid waste disposal.

Implementing the proposed SLWRI alternatives would not have a significant cumulative effect on utilities and service systems in the primary study area. As discussed above, construction activities associated with CP1–CP5 could inadvertently damage utilities and public service systems infrastructure. In addition, utilities and service systems could be temporarily disrupted to accommodate construction activities. These effects would be of greater magnitude and longer in duration with the larger dam raises. Thus, the effects of CP2 would be similar to but greater than those of CP1 and similar to but less than those of CP3–CP5. Although Mitigation Measure Util-1 would reduce these project-level effects, they would not be eliminated. In addition to the projects identified by the City of Shasta Lake (Moody Flats Quarry EIR and Mountain Gate at Shasta Mixed-Use Area Plan EIR) in their comments on the DEIS, there are two present or reasonably foreseeable future actions, the Antlers Bridge replacement and the Iron Mountain Restoration Plan located in the immediate vicinity of Shasta Lake. With respect to projects currently undergoing CEQA review, these projects are still in the planning phase and there is uncertainty as to what if any action alternatives may be selected, therefore they are not considered as reasonably foreseeable. The Antlers Bridge and Iron Mountain project do have the potential to damage or disrupt utilities and public service systems infrastructure. The Antlers Bridge replacement is currently under construction and is expected to be completed in 2015, which is before implementation of any of the action alternatives would begin. With respect to the Iron Mountain Mine Restoration Plan, it is unlikely that this activity would occur simultaneously with the action alternatives. Therefore, construction activities related to implementation of the proposed SLWRI alternatives would not contribute considerably to significant cumulative impacts related to utility impacts.

The effects of CP1–CP5 on utilities and service systems would diminish with distance from the project construction sites and would also not have

cumulatively considerable effects on utilities and public service systems downstream from Red Bluff (i.e., in the extended study area).

Chapter 22
Public Services

22.1 Affected Environment

This section describes the affected environment related to public services for the dam and reservoir modifications proposed under SLWRI action alternatives. The public services addressed are fire protection, emergency services, law enforcement, and schools. Utilities, sewer services, and water supply are analyzed in Chapter 21, "Utilities and Service Systems," of this EIS.

Because of the potential influence of the proposed modification of Shasta Dam and water deliveries over a large geographic area, the SLWRI includes both a primary study area and an extended study area. The primary study area has been further divided into the Shasta Lake and vicinity portion and the upper Sacramento River (Shasta Dam to Red Bluff) portion. The extended study area has been further divided into the lower Sacramento River and Delta portion, and the CVP/SWP service areas portion.

The public services setting for Shasta Lake and vicinity consists of the portion of Shasta County above Shasta Dam. Public services needs in this region are influenced by rugged, mountainous terrain, rural lakeside communities, and Shasta Lake. The public services setting for the upper Sacramento River portion of the primary study area consists of Shasta County below Shasta Dam and Tehama County. Public services needs in this area are influenced by topography and population densities. Four incorporated cities—the Cities of Shasta Lake, Redding, Anderson, and Red Bluff—create an urban setting in the otherwise rural upper Sacramento Valley, which is characterized by rolling hills with mountains to the north, east, and west.

The public services setting for the extended study area consists of 24 counties downstream from Red Bluff and encompasses all areas served by the CVP and the SWP.

Table 22-1 lists the public service providers considered in this EIS.

Table 22-1. Key Public Service Providers

Fire Protection Services
U.S. Forest Service
California Department of Forestry and Fire Protection
Shasta County Fire Department
Tehama County Fire Department
Redding Fire Department
Shasta Lake Fire Protection District
Anderson Fire Protection District
Red Bluff Fire Department
Corning Volunteer Fire Department
Emergency Services
California Highway Patrol
California Office of Emergency Services
Shasta County Sheriff's Office
Tehama County Sheriff's Department
Shasta Area Safety Communications Agency
Shasta Regional Medical Center
Mercy Medical Center Redding
Shasta Community Health Center
St. Elizabeth Community Hospital
Law Enforcement
U.S. Forest Service
U.S. Bureau of Land Management
California Highway Patrol
California Department of Fish and Wildlife
Shasta County Sheriff's Office
Tehama County Sheriff's Department
Red Bluff Police Department
Corning Police Department
Schools
Gateway Unified School District

22.1.1 Fire Protection Services

Fire protection services consist of fire suppression, emergency dispatching, specialized training, fire prevention, fire safety education, and emergency medical response. Chapter 9 (Hazards and Hazardous Materials and Waste) describes the fire risk and provides historic fire data for the primary and extended study areas.

Shasta Lake and Vicinity

The Shasta County Fire Department (SCFD) and the California Department of Forestry and Fire Protection (Cal Fire) respond to nonwildland fires in the Shasta Lake and vicinity portion of the primary study area. The Shasta Lake Fire Protection District (SLFPD) is the first responder in the event of an emergency within the City of Shasta Lake. Nonwildland fires consist of structural, chemical, petroleum, electrical, vehicle, and other fires that involve human-made materials. Cal Fire and USFS are responsible primarily for wildland fires, which consist of fires in vegetated areas such as forests, chaparral, and grassland.

Cal Fire and USFS generally respond according to established jurisdictional boundaries. Under an agreement with the U.S. Department of the Interior, Bureau of Land Management (BLM), Cal Fire provides fire protection resources for lands managed by BLM throughout the primary study area. Additionally, a fire protection agreement between Cal Fire and USFS provides for the sharing of fire protection resources to augment the capabilities of each agency (USFS 1995). In practice, SCFD, Cal Fire, and USFS provide mutual assistance when needed.

The National Interagency Fire Center, located in Boise, Idaho, assists with wildland fire suppression nationwide. The center represents a collaboration among seven Federal agencies: the Bureau of Indian Affairs, BLM, USFS, USFWS, the National Park Service, the National Weather Service, and the Office of Aircraft Services. These agencies work together to coordinate and support wildland fire and disaster operations. Cal Fire and the California Emergency Management Agency (Cal EMA) (formerly Governor's Office of Emergency Services (OES)) work closely with these agencies to manage wildland fire operations.

Upper Sacramento River (Shasta Dam to Red Bluff)

Fire protection services in the upper Sacramento River portion of the primary study area are similar to those in the Shasta Lake and vicinity portion. SCFD and the Tehama County Fire Department (TCFD) are responsible primarily for nonwildland fires, and Cal Fire and USFS respond primarily to wildland fires.

In Shasta County, the Redding Fire Department, SCFD, and Cal Fire have mutual aid agreements to ensure adequate fire protection services and to share resources. Under these agreements, the agencies respond to emergencies in Shasta County that are in adjacent jurisdictions.

Fire departments serving the unincorporated areas of Shasta County include 1 SCFD station that is housed in Redding, 12 community fire districts, and 19 volunteer fire companies. Cal Fire operates several fire stations during the off-season winter months, through an agreement with BLM and local fire departments. The community fire districts operate autonomously; the remaining

fire departments, fire stations, and the Shasta County Fire District fall under the jurisdiction of SCFD.

The Cities of Shasta Lake, Redding, and Anderson are incorporated cities in Shasta County. Fire protection in Redding is provided by the Redding Fire Department, which has 8 fully equipped stations and 72 full-time employees. The SLFPD provides fire protection with the City of Shasta Lake, supported by 3 fire stations with 27 employees. The Anderson Fire Protection District provides service to Anderson and operates 2 fire stations with 15 employees.

Shasta and Tehama counties share fire protection resources along their shared county line, through a mutual aid agreement. Like SCFD, TCFD has mutual aid agreements with local fire protection agencies that operate in the county. One difference between Shasta and Tehama counties is the level of integration with Cal Fire: TCFD is fully integrated with Cal Fire, which administers fire protection services in all unincorporated areas of the county except for the areas covered by the Gerber and Capay fire protection districts.

TCFD provides fire protection services for the residents of Tehama County through a network of 16 fire stations and 15 volunteer fire companies. Five of the stations, Los Molinos, Corning, Bowman, El Camino, and Antelope, are staffed 24 hours a day, year round. The distribution of stations places most residents of Tehama County within 5 road miles of a responding fire station.

Red Bluff and Corning are incorporated cities in Tehama County; both cities provide fire protection services for their residents. Fire protection in Red Bluff is provided by the Red Bluff Fire Department. The Corning Volunteer Fire Department, which employs full-time staff assisted by volunteers, provides fire protection for the incorporated area of Corning.

Other fire protection services in Tehama County include the Gerber Fire Protection District, Lassen Volcanic National Park, Capay Fire Protection District, and Cottonwood Fire Protection District.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Fire protection services in the extended study area are similar to those discussed for the primary study area. However, urban population densities are higher in parts of the extended study area, which influences the types and extent of the fire protection services that are provided. Cities and counties in the extended study area provide fire protection services primarily for nonwildland fires, and Cal Fire and USFS provide fire protection services primarily for wildland fires.

22.1.2 Emergency Services

Emergency services consist of emergency preparation, response, and recovery efforts. Emergencies range from calls for medical assistance to individuals, to large-scale disasters, such as evacuations resulting from wildland fires and floods.

Shasta Lake and Vicinity

The Shasta County Sheriff's Office (SCSO) is responsible for coordinating emergency services on Shasta Lake and in the unincorporated areas of Shasta County upstream from Shasta Dam. Large-scale emergency services are handled by SCSO, in cooperation with the State emergency response network run by Cal EMA. As of 1996, OES (now Cal EMA) had designated emergency service "Operational Areas" for all California counties, cities, and special districts (e.g., school, water, and waste reclamation districts). Shasta Lake and vicinity is located in the Region 3 Operational Area, which consists of 12 Northern California counties. Emergency services providers can be called on to assist with emergencies that occur in their designated region and to assist the Central and South emergency services regions. Cal Fire, USFS, BLM, the Federal Emergency Management Agency, and the American Red Cross also provide assistance in large-scale emergencies.

SCSO provides emergency services, including patrol boats and deputies, at Shasta Lake from a substation at Bridge Bay Marina. Medical aid is provided by Shasta County fire departments and private ambulance companies, including land and air ambulance services, based in the Redding area.

Upper Sacramento River (Shasta Dam to Red Bluff)

Emergency services in the upper Sacramento River area are similar to those described in the previous section. SCSO is responsible for coordinating emergency services in the Shasta County part of the upper Sacramento River area, and the Tehama County Sheriff's Department is responsible for coordinating emergency services in the Tehama County part. Both county agencies coordinate emergency services with Cal EMA and serve as the emergency services headquarters during declared public emergencies.

A number of emergency services agencies in Shasta County have formed a joint-powers agency, called the Shasta Area Safety Communications Agency, to consolidate emergency services related to fire, medical services, and law enforcement. Current participants include the Redding Fire Department, the Redding Police Department, and SCSO. American Medical Response, Redding Medical Center, and Mercy Medical Center in Redding participate in the Shasta Area Safety Communications Agency under a contractual agreement for ambulance services. Emergency medical response is also provided by St. Elizabeth Community Hospital in Red Bluff.

The Tehama County Sheriff's Department is responsible for emergency services coordination in Tehama County. In addition, TCFD responds to some medical emergencies in Tehama County.

The California Highway Patrol (CHP), Northern Division, provides ground and air support for emergencies along the Interstate 5 (I-5) corridor and State highways throughout the primary study area. CHP maintains two A-star helicopters and two Cessna airplanes that are used to assist other agencies with search and rescue, and fire response. In addition, CHP assists with traffic control during emergencies.

Emergency services in the upper Sacramento River area are also supplemented by Cal Fire, USFS, the Federal Emergency Management Agency, and the American Red Cross.

Several hospitals and other facilities in Shasta and Tehama County provide emergency and urgent care services. Shasta Regional Medical Center, Mercy Medical Center Redding, and Shasta Community Health Center are located in Redding and serve the Shasta Lake and Redding areas. St. Elizabeth Community Hospital is located in Red Bluff and serves Tehama County.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Emergency services in the extended study area are similar to those discussed for the primary study area. Cities and counties in the extended study area are primarily responsible for providing emergency services, and they receive assistance from regional, State, and Federal agencies for emergencies that require resources beyond the capability of the local jurisdiction.

22.1.3 Law Enforcement

Law enforcement services consist of crime prevention, investigation, and apprehension of lawbreakers and include duties to keep the peace and protect life and property. Law enforcement agencies often enter into cooperative aid agreements with neighboring or overlapping law enforcement jurisdictions to consolidate resources and facilitate communication.

Shasta Lake and Vicinity

Law enforcement services in the Shasta Lake and vicinity portion of the primary study area are provided by SCSO, CHP, CDFW, BLM, and USFS. In general, the nature of an offense or law enforcement duty establishes jurisdiction. SCSO has primary responsibility for conflicts between people and most violations of State law, CHP handles most traffic violations, CDFW enforces State fish and game laws, and BLM/USFS handle violations of Federal law.

Agencies responsible for law enforcement on Shasta Lake and the surrounding area carry out their duties from several locations. SCSO operates a substation in the City of Shasta Lake with nine assigned deputies and another substation in Lakehead with two resident deputies. Because of the nature and volume of human activity around Shasta Lake, SCSO also maintains a substation at Bridge Bay Marina, located on the main dock above the store. SCSO's boat dock is located on the main dock near the substation. Services provided by SCSO include search and rescue, safety patrol boats, boating safety education, emergency services, and animal control.

USFS and BLM use Federal law enforcement officers with jurisdiction on Federal lands. USFS and BLM do not assume the Sheriff's responsibilities; instead, they enforce the Federal codes that govern public behavior on lands managed by USFS and BLM. The CDFW Northern District enforcement unit is based in Redding and provides law enforcement related to State fish and game laws in Shasta, Trinity, and Tehama counties.

Traffic law enforcement along I-5, State routes, and State highways is provided primarily by the Northern Division of CHP. CHP operates several offices in the primary study area, including offices in Redding and Red Bluff.

Upper Sacramento River (Shasta Dam to Red Bluff)

Reclamation's Security, Safety and Law Enforcement (SSLE) Office, located in Denver, is responsible for protecting the public, Reclamation employees, and Reclamation facilities through the development and implementation of an integrated security, safety, and law enforcement program. The SSLE Office manages security, safety, and law enforcement for Reclamation programs and projects such as Shasta Dam; develops Reclamation-wide policies and guidelines governing these programs; and provides oversight of program execution in Reclamation field offices.

SCSO provides law enforcement services for the unincorporated areas of Shasta County. County law enforcement operations are based in Redding. Sheriff substations are located in Burney, the City of Shasta Lake, and Shingletown. The incorporated cities of Redding and Anderson provide law enforcement services for their residents. USFS and BLM use Federal law enforcement officers with jurisdiction on Federal lands.

The Tehama County Sheriff's Department office is located in Red Bluff. The sheriff is the chief law enforcement officer of Tehama County, with jurisdiction throughout the unincorporated county, the incorporated cities, and State-owned property. The incorporated cities of Red Bluff and Corning provide law enforcement services for their residents.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Law enforcement services in the extended study area are similar to those discussed for the primary study area. Counties maintain sheriff's departments that have jurisdiction within the county boundaries, and incorporated cities maintain police departments that have jurisdiction within the city limits. However, urban population densities are higher in parts of the extended study area, which influences the types and extent of law enforcement services provided. USFS and BLM use Federal law enforcement officers with jurisdiction on Federal lands.

22.1.4 Schools

School districts are autonomous entities responsible for providing educational services for elementary, middle school, and high school students. Districts elect their own governing boards and appoint their own superintendents. County offices of education assist the school districts with administrative and curricular support.

Shasta Lake and Vicinity

No schools are located in the Shasta Lake and vicinity portion of the primary study area. The Gateway Unified School District serves residents in this area and previously operated Canyon Elementary in Lakehead. This school, however, is currently closed.

Upper Sacramento River (Shasta Dam to Red Bluff)

School districts in the upper Sacramento River area serve students in levels kindergarten through grade 12. Shasta County is served by 25 school districts, and Tehama County is served by 21 school districts. The California Community College system provides continuing education services at locations in Shasta County and Tehama County. Simpson University, located in Redding, also provides college-level educational services.

The Gateway Unified School District operates several schools in Shasta County. Mountain Lakes High School (grades 10 through 12) and Shasta Lake Alternative School (kindergarten through grade 12) are located at the northeast corner of the intersection of Lake Boulevard and Shasta Dam Boulevard.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Educational services in the extended study area are similar to those discussed for the primary study area. Cities and counties form school districts to provide educational services for children between 6 and 18 years of age. Numerous community colleges and 4-year colleges and universities are also located in the extended study area. Urban population densities are higher in parts of the extended study area, which influences the variety of educational services provided.

22.2 Regulatory Framework

22.2.1 Federal

Shasta-Trinity National Forest Land and Resource Management Plan

USFS personnel conduct their responsibilities for regulating the use of and protecting national forest lands under Title 36 and sections of Titles 16, 18, and 21 of the Code of Federal Regulations. Public services directives from the Code of Federal Regulations are integrated into the Shasta-Trinity National Forest Land and Resource Management Plan (LRMP), which includes the following topics: fire and fuels management, facilities management, law enforcement, and land management.

The LRMP identifies goals, standards, and guidelines related to public services in Shasta-Trinity National Forest. The following goals, standards, and guidelines related to public services in Shasta-Trinity National Forest have been excerpted from the LRMP (USFS 1995):

Fire and Fuels Goals (LRMP, p. 4-4)

- Achieve a balance of fire suppression capability and fuels management investments that are cost effective and able to meet ecosystem objectives and protection responsibilities.

Fire and Fuels Standards and Guidelines (LRMP, p. 4-17)

- Wildland fires will receive an appropriate suppression response that may range from confinement to control. Unless a different suppression response is authorized in this plan, or subsequent approved plans, all suppression responses will have an objective of "control."

- All wildland fires, on or threatening private land protected by agreement with the State of California, will receive a "control" suppression response.

- Fire prevention efforts will be designed to minimize human-caused wildfires commensurate with the resource values at risk.

Facilities Goals (LRMP, p. 4-4)

- Provide and maintain those administrative facilities that effectively and safely serve the public and USFS workforce.

Facilities Standards and Guidelines (LRMP, p. 4-17)

- Manage, construct, and maintain buildings and administrative sites to meet applicable codes and to provide the necessary facilities to support resource management.

- Closure of roads and/or selected areas to assist in management of Forest resources may be made by regulatory and/or physical devices on the road for the following purpose[s]: safety, fire, and general administrative purposes.

Law Enforcement Goals (LRMP, p. 4-5)

- Establish priority in law enforcement activities as follows: (a) provide for employee and public safety, (b) protect resources and property, (c) provide for the accomplishment of management objectives, and (d) prevent violation of laws and associated loss and damage.

Law Enforcement Standards and Guidelines (LRMP, p. 4-21)

- Protect the public interest by a thorough and aggressive program of violation prevention, violation detection, investigation and apprehension of violators, and prosecution.

U.S. Bureau of Land Management Resource Management Plan

BLM manages a number of public lands adjacent to the Sacramento River corridor downstream from Shasta Dam. The study area falls under two BLM districts (Northern California and Central California) and the resource management plans (RMP) of three BLM field offices: Redding, Ukiah, and Mother Lode (BLM 2006a). The purpose of BLM's RMPs is to provide overall direction for managing and allocating public resources in each planning area. The RMP for the Redding field office states that any fire occurring on public lands would be suppressed.

22.2.2 State

Standardized Emergency Management Systems

The Standardized Emergency Management Systems law (Government Code Section 8607) directs Cal EMA (formerly OES) to establish, implement, and maintain a coordinated emergency response system. The California Mutual Aid Agreement defines responsibilities and resource sharing between agencies to ensure that adequate resources, facilities, and other support are provided to jurisdictions when their own resources are insufficient to cope with the needs of a given emergency.

California Education Code

The California Education Code provides educational goals and requirements for the educational providers in the state (Title 5 of the California Code of Regulations). It governs school district formation and operation, county board of education authorities and responsibilities, and educational criteria for children between 6 and 18 years of age.

California Fire Plan

The California Fire Plan provides guidance for reducing the risk of wildfire. The following are the basic principles of the fire plan:

- Community involvement
- Community risk assessment
- Development of solutions and implementation of projects

22.2.3 Regional and Local

Shasta County General Plan

The *Shasta County General Plan* (Shasta County 2004) identifies goals, objectives, and policies related to public services in Shasta County. Fire protection and law enforcement services are discussed in the section titled "Fire Safety and Sheriff Protection." Schools are discussed in the section titled "Public Facilities."

Tehama County General Plan Update 2009–2029

The *Tehama County General Plan Update 2009–2029* (Tehama County 2009) identifies goals, objectives, and policies for public services in Tehama County. The public services element of the general plan addresses concerns associated with growth and development as they relate to public services, including schools. The safety element addresses potential dangers and damages associated with fire, floods, earthquakes, landslides, and other hazards.

22.3 Environmental Consequences and Mitigation Measures

22.3.1 Methods and Assumptions

This section addresses potential impacts associated with implementation of the project on the following public services: law enforcement, fire protection, emergency services, and schools. The analysis is based on a review of planning documents applicable to the project area, consultation with various agencies, and field reconnaissance.

22.3.2 Criteria for Determining Significance of Effects

An environmental document prepared to comply with the NEPA must consider the context and intensity of the environmental effects that would be caused by, or result from, the proposed action. Under NEPA, the significance of an effect is used solely to determine whether an EIS must be prepared. An environmental document prepared to comply with the CEQA must identify the potentially significant environmental effects of a project. A "[s]ignificant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines Section 15382). CEQA also requires that the environmental

document propose feasible measures to avoid or substantially reduce significant environmental effects (State CEQA Guidelines, Section 15126.4(a)).

The following significance criteria are based on guidance provided by the State CEQA Guidelines and consider the context and intensity of the environmental effects as required under NEPA. Impacts of an alternative on public services would be significant if project implementation would do any of the following:

- Interfere with emergency services
- Degrade the level of service of a public service
- Require relocating public service facilities
- Require substantial improvements to the facilities or level of staffing of a public service to maintain its existing level of service

22.3.3 Topics Eliminated from Further Consideration

No topics were eliminated from consideration.

22.3.4 Direct and Indirect Effects

No-Action Alternative

The impact discussion for the No-Action Alternative addresses Shasta Lake and vicinity and the upper Sacramento River together because this alternative would not affect land use in any of the primary study area locations. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because the distance from the project area would result in similar impacts.

Shasta Lake and Vicinity, Upper Sacramento River (Shasta Dam to Red Bluff), Lower Sacramento River and Delta, and CVP/SWP Service Areas

Impact PS-1 (No-Action): Disruption of Public Services Under the No-Action Alternative, no new facilities would be constructed in the primary or extended study areas, and no changes in Reclamation's existing facilities or operations would occur that would directly or indirectly result in the disruption of public services in the project area. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact PS-2 (No-Action): Degraded Level of Public Services Under the No-Action Alternative, no new facilities or infrastructure would be constructed in the primary or extended study areas and no changes in Reclamation's existing facilities or operations would occur that would directly or indirectly result in degraded levels of public services in the project area. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

Impact PS-3 (No-Action): Relocation of Public Service Facilities Under the No-Action Alternative, no new facilities would be constructed in the primary or extended study areas and no changes in Reclamation's existing facilities or

operations would occur that would directly or indirectly result in the relocation of public service facilities in the project area. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

The impact discussion for CP1 addresses Shasta Lake and vicinity and upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP1): Short-Term Disruption of Public Services Project construction could result in short-term disruption of emergency services response as well as short-term disruption to school bus services throughout the Gateway Unified School District. Short-term traffic delays and access restrictions would require traffic controls and coordination with public services agencies. Although Reclamation would implement measures to lessen short-term disruption of public services, this impact would be potentially significant.

Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies, including food and shelter for emergency crews and public services staff, could also be affected by project implementation because of temporary increases in the work force.

Direct impacts could include disruption of traffic flows and street operations through temporary lane closures, detours, blockages, and restrictions on curbside parking; these impacts could result in delays for emergency services vehicles and school buses traveling through or around construction zones. In addition, project construction could cause short-term interruptions in power and telecommunications services, which could affect emergency response capabilities in the primary study area.

Construction activities that could disrupt emergency services and school bus service in the primary study area include road and bridge replacement, telecommunications facility replacement, power facility replacement, vegetation clearing for utility relocation, structure removal, marina relocation, and emergency services facility relocation. Reclamation estimates that construction activities for CP1 would take 4.5 years.

Routes proposed for transporting construction materials to the dam consist of I-5 and local roads, particularly Shasta Dam Boulevard and Lake Boulevard. These routes are used primarily by Reclamation personnel to access the Shasta Dam facilities, by visitors and tourists, and by residents of the City of Shasta Lake. At this time, no detours or lane closures are proposed for the portions of Shasta Dam Boulevard and Lake Boulevard that serve the City of Shasta Lake. Road closures would likely be required adjacent to the facilities in the immediate vicinity of Shasta Dam and Reclamation's Northern California Area Office.

The Gateway Unified School District covers Shasta Lake and vicinity and portions of the upper Sacramento River area. Project construction could result in traffic delays and the need to reroute local traffic to ensure public health and safety. School bus routes could be temporarily affected by road closures and detours during project construction in communities around Shasta Lake.

Several roads around Shasta Lake would be affected by infrastructure, utility, and marina relocation activities. These activities could require road closures, detours, or traffic restrictions.

Emergency supplies and resources that could be affected by project implementation include food, shelter for emergency crews and local residents, and public services staff and equipment. Project construction activities are located within commuting distance of Redding, where ample food and shelter are available in emergencies. The Cal EMA network could supplement local emergency services staffing and equipment levels. However, Cal EMA may not be able to provide assistance when wildfires in the state require Cal EMA resources.

Construction activities at Shasta Dam and various locations surrounding Shasta Lake could affect emergency response capabilities throughout Shasta County (i.e., in a portion of the upper Sacramento River area) because the areas share emergency services resources and responsibilities.

In summary, project construction could result in short-term disruption of school bus services throughout the Gateway Unified School District. Short-term traffic delays and access restrictions would require traffic controls and coordination with public services agencies. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP1): Degraded Level of Public Services Project implementation could temporarily degrade local public resources. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services would not be substantially degraded by construction activities, this impact would be potentially significant.

Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure combined with possible consolidation of recreational facilities (e.g., USFS administrative facilities, campgrounds, boat ramps, marinas) could result in changing demands for public services. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the locations of some public services, which could affect the areas where the public services are currently located.

Project implementation could also result in degraded levels of public services in the upper Sacramento River portion of the primary study area because the Shasta Lake area and parts of the upper Sacramento River area share public services. Project construction activities at Shasta Lake could require the use of public services resources that could be needed simultaneously for public services assistance in the upper Sacramento River area.

Reclamation estimates that CP1 would take 4.5 years to complete. Public services levels that are increased as a result of the project would return to pre-project levels once construction activities were completed. However, project implementation could temporarily degrade local public resources. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP1): Relocation of Public Services The project would require relocation of some public service facilities in the Shasta Lake and vicinity portion of the primary study area. No public services facilities in the upper Sacramento River portion of the primary study area would need to be relocated. This impact would be less than significant.

The Whiskeytown-Shasta-Trinity National Recreation Area is managed by USFS, which has several facilities throughout the reservoir area. Two USFS facilities would be inundated and thus would require relocation or replacement. The work station located in the Lakeshore area would be inundated by raising Shasta Dam and would have to be relocated to an area above the new full pool. The new facility would contain all of the features that exist at the current facility. The inundated facility would be demolished and hauled to waste. At Turntable Bay, another USFS facility would be inundated by the raising of Shasta Dam. Additional space at Turntable Bay would allow for the facility to be relocated on fill in the current location. Also, the SCSO substation and dock at the Bridge Bay Marina could need to be relocated within the marina complex. Reclamation would construct the replacement facilities before abandonment and demolition of the existing facilities, thereby ensuring that levels of public services provided by these facilities would not be adversely affected by the relocation process. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP1): Short-Term Disruption of Public Services Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. The northern end of the extended study area would be more than 30 miles from the nearest project construction activities. Emergency services providers with mutual aid agreements that could be called on to assist with emergencies resulting from project activities are located in the primary study area. Project construction activities in the primary study area that could disrupt public services would be too far removed from the extended study area to disrupt emergency services or law enforcement serving areas south of Red Bluff. Project implementation would not disrupt school bus service in the extended study area because school districts located in the extended study area would not operate school bus routes in or near project construction activities. Therefore, no impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP1): Degraded Levels of Public Services Construction activities are not expected to affect public service levels in the extended study area. Existing facilities, personnel, and equipment in the extended study area could provide short-term assistance for project-related public services needs without degrading public services levels in the extended study area. This impact would be less than significant.

The northern end of the extended study area would be more than 30 miles from the nearest project construction activities. Public services providers with mutual aid agreements that could be called on to assist with law enforcement, fire suppression, or other emergencies resulting from project activities are located in the primary study area. Project construction activities around Shasta Lake are too far removed from the extended study area to disrupt public services below Red Bluff. Public services providers located in the extended study area could be called on by Cal EMA to assist with large-scale emergencies in the primary study area that resulted from project implementation. However, existing facilities, personnel, and equipment in the extended study area would be adequate to maintain current levels of service while providing assistance to the primary study area.

Indirect impacts on public services in the extended study area could result from traffic accidents associated with the transport of project materials and workers. Some project materials and workers could originate in the extended study area, requiring northbound travel to the primary study area. At this time, Reclamation estimates that the project would employ 350 workers. Project-related travel that would likely occur on I-5, the railway, or via air transport is not anticipated to result in accidents in the extended study area that would require significant response from law enforcement, fire protection, or emergency services providers; however, the fact that traffic accidents resulting from project-related travel could occur in the extended study area means that the possibility of

travel-related accidents would exist. Existing facilities, personnel, and equipment in the extended study area are expected be adequate to maintain current levels of service while providing assistance for any such accidents.

Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP1): Relocation of Public Services Facilities Project implementation would not result in the relocation of public services facilities in the extended study area. Therefore, public services in the extended study area would not be affected by relocation of public services facilities. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

The impact discussion for CP2 addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP2): Short-Term Disruption of Public Services Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant.

Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near the relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity of Shasta Lake, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (e.g., food, shelter for emergency crews, public services staff) could also be affected by project implementation.

Impacts related to short-term disruption of emergency services that would result from implementing the 12.5-foot dam raise (CP2) are similar to those identified for the 6.5-foot dam raise (Impact PS-1 (CP1)). However, the duration of the impacts would be longer for CP2 because construction activities associated with

the 12.5-foot dam raise would take more time than under the 6.5-foot dam raise. The 12.5-foot dam raise would require significantly more concrete and is anticipated to take 6 more months to construct than the 6.5-foot dam raise (CP1).

The increased amount of infrastructure demolition and relocation activity associated with CP2 would also require more time than under CP1. More structures would need to be demolished and relocated, and additional power and telecommunication lines would need to be relocated. Additional septic systems and wells would also require demolition and relocation, and 20 additional road segments would need to be realigned for CP2. The increased construction activity in the Shasta Lake and vicinity portion of the primary study area under CP2 would extend the duration of potential disruption to emergency services and school bus service in that area. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP2): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services would not be substantially degraded, this impact would be potentially significant.

Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure combined with possible consolidation of recreational facilities (e.g., campgrounds, boat ramps, marinas) could result in changing demands for public services. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the locations of some public services, which could affect the areas where the resources are currently located.

This impact would be similar to Impact PS-2 (CP1). However, the impacts would last longer for CP2 than CP1 because more time would be needed to complete project construction under the 12.5-foot dam raise. Reclamation estimates that CP2 would take 5 years to complete. Project implementation could temporarily degrade local public services. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP2): Relocation of Public Services Facilities This impact would be similar to Impact PS-3 (CP1). Facility relocation would not degrade levels of public services when the public service agencies relocated to their new facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP2): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP2): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP2): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public service facilities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival

The impact discussion for CP3 addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP3): Short-Term Disruption of Public Services Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant.

Construction activities associated with enlarging Shasta Dam and the related infrastructure (e.g., road relocations, bridge replacements) near the dam and near the relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (food, shelter for

emergency crews, public services staff) could also be affected by project implementation.

This impact would be similar to Impact PS-1 (CP1). However, the impact would last longer for CP3 because construction activities associated with the 18.5-foot dam raise would take more time than for the 6.5-foot dam raise. Reclamation estimates that the 18.5-foot dam raise would take 5 years. The 18.5-foot dam raise would require significantly more concrete and is anticipated to take 6 more months to construct than the 6.5-foot dam raise (CP1). The increased amount of infrastructure demolition and relocation activity associated with CP3 would also require more time than for CP1. Almost twice as many structures would need to be demolished and relocated, and additional power and telecommunication lines would require removal and relocation. Additional septic systems and wells would be abandoned and relocated, and 25 more road segments would be realigned. The increased construction activity at Shasta Dam and in the surrounding area would extend the time of potential disruption to emergency services. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP3): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded, this impact would be potentially significant.

Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure, combined with possible consolidation of recreational facilities (e.g., campgrounds, boat ramps, marinas), could result in changing demands for public services. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the locations of some public services, which could affect the areas where the public services are currently located.

This impact would be similar to Impact PS-2 (CP1). However, the impact would last longer for CP3 than for CP1 because more time would be needed to complete project construction for the 18.5-foot dam raise. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP3): Relocation of Public Services Facilities This impact would be similar to Impact PS-3 (CP1). Facilities relocation would not degrade levels of public services while the public services agencies are relocating to new

facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP3): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP3): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP3): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public services facilities in extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

The impact discussion for CP4 and CP4A addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP4 and CP4A): Short-Term Disruption of Public Services
Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant for CP4 and CP4A.

This impact would be similar to Impact PS-1 (CP3). Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near the relocation sites for

utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity of Shasta Lake, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (e.g., food, shelter for emergency crews, public services staff) could also be affected by project implementation. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for short-term disruption of public services in the primary study area.

This impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 22.3.5.

This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP4 and CP4A): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded, this impact would be potentially significant.

This impact would be similar to Impact PS-2 (CP3). Project implementation could result in short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. The relocation of infrastructure, combined with possible consolidation of recreational facilities (e.g., campgrounds, boat ramps, marinas), could result in changing demands for public services. Project construction proposed around Shasta Lake could require local, State, and Federal agencies to change the location of some public services, which could affect the areas where the public services are currently located. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for degradation of public services.

This impact would be potentially significant for CP4. Mitigation for this impact is proposed in Section 22.3.5.

This impact would be potentially significant for CP4A. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP4 and CP4A): Relocation of Public Services Facilities This impact would be similar to Impact PS-3 (CP1). Facilities relocation would not

degrade levels of public services while the public services agencies are relocating to new facilities.

This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas

Impact PS-4 (CP4 and CP4A): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. Therefore no impact would occur for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP4 and CP4A): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area.

This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP4 and CP4A): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public services facilities in the extended study area. No impact would occur for CP4 or CP4A. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

The impact discussion for CP5 addresses Shasta Lake and vicinity and the upper Sacramento River together because impacts from construction activities would affect both areas. It also addresses the lower Sacramento River and Delta and the CVP/SWP service areas together because their distance from the project area would result in similar impacts.

Shasta Lake and Vicinity and Upper Sacramento River (Shasta Dam to Red Bluff)

Impact PS-1 (CP5): Short-Term Disruption of Public Services Project construction could temporarily disrupt transportation and circulation patterns, which could affect emergency services response and school bus service.

Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded by construction activities, this impact would be potentially significant.

This impact would be similar to Impact PS-1 (CP3). Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response and school bus service. Emergency preparedness, emergency communications, and emergency supplies (e.g., food, shelter for emergency crews, public service staff) could also be affected by project implementation. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for short-term disruption of public services in the primary study area. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-2 (CP5): Degraded Levels of Public Services Project implementation could cause short-term degradation of levels of public services, including law enforcement, fire protection, and emergency services. Although Reclamation would provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services were not substantially degraded, this impact would be potentially significant.

This impact would be similar to Impact PS-2 (CP3). Project implementation could result in short-term degradation of levels of public services, including impacts on law enforcement, fire protection, and emergency services. This conclusion is based on the size of the project and proposed locations for construction activity associated with infrastructure alterations. Project construction activities proposed around Shasta Lake could require local, State, and Federal agencies to change the location of some public services, which could affect the areas where the public services are currently located. In addition, gravel augmentation and the habitat restoration activities along the upper Sacramento River would slightly, but not substantially, increase the potential for degradation of public services. This impact would be potentially significant. Mitigation for this impact is proposed in Section 22.3.5.

Impact PS-3 (CP5): Relocation of Public Services Facilities This impact is similar to Impact PS-3 (CP1). Facilities relocation would not degrade levels of public service while the public service agencies are relocating to new facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta and CVP/SWP Service Areas
Impact PS-4 (CP5): Short-Term Disruption of Public Services This impact would be similar to Impact PS-4 (CP1). Project implementation would not disrupt public services in the extended study area because of the distance of the extended study area from project elements that could affect public services. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-5 (CP5): Degraded Levels of Public Services This impact would be similar to Impact PS-5 (CP1). Project construction activities are not expected to affect public services levels in the extended study area. Existing facilities, staff, and equipment in the extended study area would be capable of providing short-term assistance for project-related public services needs without degrading levels of public services in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact PS-6 (CP5): Relocation of Public Services Facilities This impact would be identical to Impact PS-6 (CP1). Project implementation would not result in the relocation of public services facilities in the extended study area. No impact would occur. Mitigation for this impact is not needed, and thus not proposed.

22.3.5 Mitigation Measures

Table 22-2 presents a summary of mitigation measures for public services.

Table 22-2. Summary of Mitigation Measures for Public Services

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact PS-1: Disruption of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact PS-2: Degraded Level of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	Mitigation Measure PS-2: Provide Support to Public Services Agencies.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact PS-3: Relocation of Public Service Facilities (Shasta Lake and Vicinity and Upper Sacramento River)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Table 22-2. Summary of Mitigation Measures for Public Services (contd.)

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact PS-4: Short-Term Disruption of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact PS-5: Degraded Levels of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS
Impact PS-6: Relocation of Public Services Facilities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI

Key:
CP = Comprehensive Plan
CVP = Central Valley ProjectLOS = level of significance
LTS = less than significant
NI = no impact
PS = potentially significant
SWP = State Water Project

No-Action Alternative

No mitigation measures are required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts PS-3 (CP1) through PS-6 (CP1). Mitigation is provided below for impacts of CP1 related to short-term disruption of public services (PS-1) and degraded levels of public services in the primary study area (PS-2).

Mitigation Measure PS-1 (CP1): Coordinate and Assist Public Services Agencies Reclamation will coordinate all proposed road closures, detours, and traffic control measures with the (SCSO) and Tehama County Sheriff's Office, which are the designated Cal EMA (formerly OES) headquarters for the primary study area.

Reclamation will appoint a public liaison to communicate construction schedules, road closures, and project activities to the public. The liaison will organize and conduct public meetings for the purpose of communicating project information. The liaison will meet with all affected public services agencies to coordinate public meetings and information exchanges.

Reclamation will obtain all necessary permits and/or authorizations from public services agencies for matters requiring agency approval and/or cooperation.

Reclamation will meet with public services agencies to determine traffic controls for infrastructure, utility, and structure relocation.

Reclamation will develop and implement a monitoring plan to track the effectiveness of this mitigation measure, and will make adjustments, if necessary.

Traffic Control and Safety Assurance Plan Reclamation will implement Mitigation Measure Trans-1 as described in Chapter 20, "Transportation and Traffic," to reduce adverse effects of road closures and detours or partial road closures on access to local streets and adjacent uses.

Implementation of this mitigation measure would reduce Impact PS-1 (CP1) to a less-than-significant level.

Mitigation Measure PS-2 (CP1): Provide Support to Public Services Agencies Reclamation will provide affected public services providers (e.g., law enforcement, fire protection, emergency services) with sufficient funding and support to ensure that levels of public services are not substantially degraded by construction activities. Reclamation will coordinate with affected providers to develop a mutual understanding of the amount and schedule of financial and administrative support required to reduce this impact to a less-than-significant level.

Reclamation will develop and implement a monitoring plan to track the effectiveness of this mitigation measure, and will make adjustments, if necessary.

Implementation of this mitigation measure would reduce Impact PS-2 (CP1) to a less-than-significant level.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts PS-3 (CP2) through PS-6 (CP2). Mitigation is provided below for the impacts of CP2 related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1 (CP2): Coordinate and Assist Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP2) to a less-than-significant level.

Mitigation Measure PS-2 (CP2): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2 (CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP2) to a less-than-significant level.

CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation is required for Impacts PS-3 (CP3) through PS-6 (CP3). Mitigation is provided below for the impacts of CP3 related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1 (CP3): Coordinate and Assist Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP3) to a less-than-significant level.

Mitigation Measure PS-2 (CP3): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2 (CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP3) to a less-than-significant level.

CP4 and CP4A -18.5 Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation is required for Impacts PS-3 (CP4 and CP4A) through PS-6 (CP4 and CP4A). Mitigation is provided below for the impacts of CP4 and CP4A related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1 (CP4 and CP4A): Coordinate and Assist Public Services Agencies This mitigation measure identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP4 and CP4A) to a less-than-significant level.

Mitigation Measure PS-2 (CP4 and CP4A): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2 (CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP4 and CP4A) to a less-than-significant level.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation is required for Impacts PS-3 (CP5) through PS-6 (CP5). Mitigation is provided below for the impacts of CP5 related to short-term disruption of public services (PS-1) and degraded levels of public services (PS-2) in the primary study area.

Mitigation Measure PS-1(CP5): Coordinate and Assist Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-1 (CP1). Implementation of this mitigation measure would reduce Impact PS-1 (CP5) to a less-than-significant level.

Mitigation Measure PS-2 (CP5): Provide Support to Public Services Agencies This mitigation measure is identical to Mitigation Measure PS-2

(CP1). Implementation of this mitigation measure would reduce Impact PS-2 (CP5) to a less-than-significant level.

22.3.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have effects on public services in the primary study area or have effects in extended study area that contribute to cumulative impacts of the SLWRI since no impacts have been identified in the extended study area. This analysis is based on the projects listed in Table 3-1 under Qualitative Analysis.

Past and present projects that could affect public services relate to construction projects, land use developments, dam construction, and recreation development. Projects listed in Table 3-1 that may have a cumulative effect on public services in the primary study area include the Antlers Bridge Replacement, Moody Flats Quarry, and the Iron Mountain Restoration Plan. SLWRI is not expected to have cumulative impacts on public services in the extended study area.

Implementing the proposed SLWRI alternatives would not have a significant cumulative effect on public services in the primary study area. As described above, CP1– CP5 would result in short-term disruption of public services, would degrade the levels of public services provided, and would require the relocation of public services facilities in the primary study area. These effects would be of greater magnitude and duration with the larger dam raises. Thus, effects of CP2 would be similar to but greater than those of CP1, and similar to but less than those of CP3–CP5. Although Mitigation Measures PS-1 and PS-2 would enhance the coordination of public services during project implementation, the adverse effects of CP1–CP5 would not be eliminated, particularly regarding short-term disruption of public services. Only three of the present or reasonably foreseeable future actions, Antlers Bridge Replacement, Moody Flats Quarry, and the Iron Mountain Restoration Plan, are located in the immediate vicinity of Shasta Lake and would have the potential to result in short-term disruption of public services, would degrade the levels of public services provided, or would require the relocation of public services facilities in the primary study area. The Antlers Bridge replacement is currently under construction and is expected to be completed in 2015, before any of the action alternatives would begin. With respect to the Iron Mountain Mine Restoration

Plan, this activity would be unlikely to occur simultaneously with the action alternatives. The Moody Flats Quarry project Draft EIR is currently being prepared by the CEQA Lead Agency, it is uncertain when actions may occur. Therefore, construction activities related to implementation of the proposed SLWRI alternatives would not contribute considerably to significant cumulative impacts on public services.

The effects of CP1–CP5 on public services would diminish with distance from project construction sites, and the alternatives would not have cumulatively considerable impacts on public services downstream from Red Bluff (i.e., in the extended study area).

Chapter 23
Power and Energy

This chapter describes the environmental and regulatory settings of power and energy, as well as environmental consequences and mitigation measures, as they pertain to the SLWRI action alternatives. The discussion of power and energy of the existing conditions and the potential impacts of the program alternatives on power and energy encompass the Pit 7 Powerplant upstream from Shasta Reservoir as well as the CVP/SWP water service areas and associated facilities.

23.1 Affected Environment

Shasta Lake is an integral part of the CVP, and the proposed changes in storage and releases affect system operations throughout the CVP. This change in CVP operations and the dedication of a portion of the storage in Shasta Lake to operate for the SWP affect the operations of the entire SWP system. Locally, the potential changes in operations would likely affect the upstream Pit 7 Powerplant.

The CVP is a multipurpose project with 20 storage facilities, 5 pumping plants, 11 hydroelectric powerplants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities. As mandated, the power generation of the CVP is first dedicated to meeting the project use requirements of the CVP facilities. Because the CVP generates more power than it uses, the excess power is marketed through the Western Area Power Administration (Western).

The SWP is a multipurpose project with 32 storage facilities. Major SWP facilities include 17 pumping plants, 8 hydroelectric powerplants, and 660-plus miles of aqueducts and pipelines. Because the SWP uses more energy than it generates from its hydroelectric facilities, DWR has exchange agreements with other utility companies and has developed other power resources. DWR sells surplus power, when it is available, to minimize the net cost of pumping energy.

For a more in-depth description of the affected environment, see the *Power and Energy Technical Report*.

23.1.1 Shasta Lake and Vicinity

The Shasta Division of the CVP contains Shasta Dam, Lake, and Powerplant, and Keswick Dam, Reservoir, and Powerplant; it captures water from the Sacramento River basin. Shasta Powerplant is located just below Shasta Dam as part of the Shasta Division. Water from the dam is released through five 15-foot penstocks leading to the 5 main generating units and 2 station service units with

a maximum generation capacity of 710 megawatts (MW). Shasta Powerplant is a peaking plant and generally runs when demand for electricity is high. The remaining energy is marketed to customers in Northern California. The 2007 net annual generation of Shasta Powerplant was 1,914,175 megawatt-hours (MWh).

23.1.2 Upper Sacramento River (Shasta Dam to Red Bluff Pumping Plant)

CVP powerplants located downstream from Shasta Reservoir but upstream from the Red Bluff Pumping Plant are Trinity, Lewiston, Judge Francis Carr, and Spring Creek powerplants of the Trinity River Division and Keswick Powerplant of the Shasta Division. The Trinity River Division captures headwaters from the Trinity River basin and diverts surplus water to the Sacramento River.

Trinity Dam stores water from the Trinity River in Trinity Reservoir and makes releases to the Trinity River through Trinity Powerplant. Downstream, Lewiston Dam makes minimum required releases to the Trinity River through Lewiston Powerplant and diverts water into Clear Creek Tunnel and through Judge Francis Carr Powerplant to Whiskeytown Reservoir. Some Whiskeytown Reservoir releases are made through Spring Creek Power Conduit and Powerplant into Keswick Reservoir in the Shasta Division. The remaining releases from Whiskeytown Reservoir are made to Clear Creek. Releases from Keswick Reservoir are made through Keswick Powerplant to the Sacramento River.

Keswick Powerplant belongs to the Shasta Division, is located at Keswick Dam, and has 3 generating units with a total capacity of 117 MW. Keswick Powerplant is a run-of-the-river facility, creating Shasta Powerplant’s afterbay and providing uniform flows to the Sacramento River.

23.1.3 Lower Sacramento River and Delta

Two CVP powerplants, Folsom and Nimbus, are located between Red Bluff Pumping Plant and the Delta. Both powerplants belong to the Folsom Unit on the American River.

Folsom Powerplant is a peaking powerplant, located at the foot of Folsom Dam on the north side of the American River. Water from the dam is released through three 15-foot-diameter penstocks to 3 generating units with a maximum capacity of 215 MW. Folsom Dam was constructed by USACE and, on completion, was transferred to Reclamation for coordinated operation as an integral part of the CVP.

Nimbus Dam forms Lake Natoma to act as an afterbay for Folsom Powerplant. It allows dam operators to coordinate power generation and flows in the lower American River channel during normal reservoir operations. Nimbus Powerplant, with 2 units and a maximum capacity of 17 MW, is a run-of-the-river facility and provides station service backup for Folsom Powerplant.

23.1.4 CVP/SWP Service Areas

There are a number of generation facilities and pumping facilities in the greater CVP/SWP service areas, beyond the specific geographies discussed above. These facilities are discussed below.

CVP Generation Facilities

The CVP powerplants located in the CVP south-of-Delta service area include New Melones Powerplant in the New Melones Unit of the CVP East Side Division, and the William R. Gianelli and O'Neill Pumping-Generating Plants in the San Luis Unit of the CVP West San Joaquin Division. The latter two, with dual functions of generating electricity and pumping water, are jointly owned by Reclamation and DWR.

New Melones Dam was completed in 1979, and inundated the original Melones Dam and created New Melones Reservoir on the Stanislaus River. New Melones Powerplant, located on the north bank immediately downstream from the dam, is a peaking plant. The powerplant contains 2 units and a maximum capacity of 383 MW.

The San Luis Unit, part of both the CVP and SWP, was authorized in 1960. Reclamation and the State of California constructed and operate this unit jointly; 45 percent of the total cost was contributed by the Federal government and the remaining 55 percent by the State of California. The joint-use facilities are O'Neill Dam and Forebay, B.F. Sisk San Luis Dam, San Luis Reservoir, William R. Gianelli Pumping-Generating Plant, Dos Amigos Pumping Plant, Los Banos and Little Panoche Reservoirs, and San Luis Canal from O'Neill Forebay to Kettleman City, together with the necessary switchyard facilities. The Federal-only portion of the San Luis Unit includes O'Neill Pumping-Generating Plant and Intake Canal, Coalinga Canal, Pleasant Valley Pumping Plant, and San Luis Drain.

San Luis Reservoir serves as the major storage reservoir, and O'Neill Forebay acts as an equalizing basin for the upper stage, dual-purpose pumping-generating plant. O'Neill Pumping-Generating Plant takes water from the Delta-Mendota Canal and discharges it into the O'Neill Forebay, where the California Aqueduct (SWP feature) flows directly. William R. Gianelli Pumping-Generating Plant lifts water from O'Neill Forebay and discharges it into San Luis Reservoir. During releases from the reservoir, these plants generate electric power by reversing flow through the turbines. Water for irrigation is released into the San Luis Canal and flows by gravity to Dos Amigos Pumping Plant, where the water is lifted more than 100 feet to permit gravity flow to the canal terminus at Kettleman City. The SWP canal system continues to southern coastal areas.

O'Neill Pumping-Generating Plant consists of an intake channel, leading off the Delta-Mendota Canal, and six pumping-generating units, with a total capacity of about 14 MW. Normally, these units operate as pumps to lift water from 45 to

53 feet into O'Neill Forebay; each unit can discharge 700 cubic feet per second (cfs) and has a rating of 6,000 horsepower (hp). Water is occasionally released from the forebay to the Delta-Mendota Canal, and these units then operate as generators.

William R. Gianelli Pumping-Generating Plant, the joint Federal-State facility located at San Luis Dam, lifts water by pump-turbines from O'Neill Forebay into San Luis Reservoir. During the irrigation season, water is released from San Luis Reservoir back through the pump-turbines to the forebay and energy is reclaimed. Each of the eight pumping-generating units has a capacity of 63,000 hp as a motor and 53 MW as a generator. As a pumping plant to fill San Luis Reservoir, each unit lifts 1,375 cfs at a design dynamic head of 290 feet. As a generating plant, each unit passes 2,120 cfs at a design dynamic head of 197 feet.

SWP Generation Facilities

Among the eight SWP hydroelectric powerplants, three powerplants are located in the Lake Oroville vicinity and the remaining in the south-of-Delta area.

Lake Oroville, the SWP's largest reservoir, stores winter and spring runoff from the Feather River watershed and releases water for SWP needs. These releases generate power at three powerplants: Edward Hyatt Pumping-Generating Plant, Thermalito Diversion Dam Powerplant, and Thermalito Pumping-Generating Plant (Oroville Facilities). DWR schedules hourly releases through the Oroville Facilities to maximize the amount of energy produced when power values are highest. Because the downstream water supply does not depend on hourly releases, water released for power in excess of local and downstream requirements is conserved by pump-back operation during off-peak times into Lake Oroville. Energy prices primarily dictate hourly operations for the power generation facilities.

The remaining five SWP powerplants are the jointly owned William R. Gianelli Pumping-Generating Plant, Alamo Powerplant, Mojave Siphon Powerplant, Devil Canyon Powerplant, and Warne Powerplant. They generate about one-sixth of the total energy used by the SWP. Alamo Powerplant uses the 133-foot head between Tehachapi Afterbay and Pool 43 of the California Aqueduct to generate electricity. Mojave Siphon Powerplant generates electricity from water flowing downhill after its 540-foot lift by Pearblossom Pumping Plant. Devil Canyon Powerplant generates electricity with water from Silverwood Lake, with more than 1,300 feet of head, the highest water head[1] in a powerplant in

[1] Potential hydropower generation is a function of the hydraulic net head and rate of fluid flow. The net head is the actual head available for power generation and is used for computing the energy generated. The net head is the gross head minus the head losses due to intake structures, penstocks, and outlet works. The gross or static head is the vertical distance between the tailwater elevation and the forebay water surface elevation (i.e., the height of water in the reservoir relative to its height after discharge). The head losses are generally assumed to be 2 to 10 percent of the gross head, depending on the configuration of the powerhouse structure.

the SWP system. Warne Powerplant uses the 725-foot drop from Peace Valley Pipeline to generate electricity with its Pelton wheel turbines.

CVP Pumping Facilities

CVP pumping plants that move water from the Delta to CVP service areas in the Central Valley include C.W. "Bill" Jones Pumping Plant, O'Neill and William R. Gianelli Pumping-Generating Plants, Dos Amigo Pumping Plant, and SWP Banks Pumping Plant. Reclamation constructed and operates C.W. "Bill" Jones Pumping Plant. Harvey O. Banks Pumping Plant is an SWP facility; however, Reclamation has access to its pumping capacity by use of the Joint Point of Diversion, described in the State Water Resources Control Board's Water Right Decision 1641. The remaining plants, described previously, are joint-use facilities between the two agencies under the San Luis Unit.

C.W. "Bill" Jones Pumping Plant, formerly Tracy Pumping Plant, is a component of the CVP Delta Division. Construction of the plant started in 1947 and was completed in 1951, with an inlet channel, pumping plant, and discharge pipes. Delta water is lifted 197 feet and is carried about 1 mile into the Delta-Mendota Canal. Each of the 6 pumps at C.W. "Bill" Jones Pumping Plant is powered by a 22,500-hp motor and is capable of pumping 767 cfs. The intake canal includes the C.W. "Bill" Jones Fish Screen, which was built to intercept downstream migrant fish to be returned to the main channel, then to resume their journey to the ocean.

Dos Amigos Pumping Plant is a joint CVP/SWP facility, located 17 miles south of O'Neill Forebay on the San Luis Canal. It lifts water 113 feet to permit gravity flow to the terminus of San Luis Canal at Kettleman City. The plant contains 6 pumping units, each capable of delivering 2,200 cfs at 125 feet of head.

SWP Pumping Facilities

Among the SWP pumping plants, plants that historically consumed most of the energy are William R. Gianelli Pumping-Generating Plant (SWP share), Harvey O. Banks Pumping Plant, Dos Amigos Pumping Plant (SWP share), Ira J. Chrisman Pumping Plant, and A.D. Edmonston Pumping Plant.

Harvey O. Banks Pumping Plant is located 2.5 miles southwest of Clifton Court Forebay on the California Aqueduct. The plant is the first pumping plant for the California Aqueduct and the South Bay Aqueduct. It provides the necessary head[2] for water in the California Aqueduct to flow for approximately 80 miles south, past O'Neill Forebay and San Luis Reservoir to Dos Amigos Pumping Plant (another jointly owned facility, as previously described). Harvey O. Banks Pumping Plant initially flows into Bethany Reservoir, where the South Bay

[2] In pumping plants, the design head is the gross head plus the head losses due to intake structures.

Aqueduct truly begins. The design head ranges between 236 and 252 feet and installed capacity is 10,670 cfs with 333,000 hp.

Along the California Aqueduct, Pearblossom, Chrisman, and Edmonston pumping plants historically consumed the highest amount of energy. Pearblossom Pumping Plant lifts water about 540 feet and discharges it 3,479 feet above mean sea level (msl), the highest point along the entire California Aqueduct. Chrisman and Edmonston pumping plants provide 524 and 1,970 feet of lift, respectively, to convey California Aqueduct water across the Tehachapi Mountains.

23.2 Regulatory Framework

There are two categories of regulatory framework for hydropower: Federal regulations for CVP hydroelectric operations, and State regulations for the SWP.

23.2.1 Federal

Reclamation operates the CVP system for the management of floodwater, irrigation and municipal and industrial (M&I) water supply, fish and wildlife enhancement, hydropower generation, recreation, and water quality, under various acts authorizing specific projects and with other laws, permits, and enabling legislation (see the *Hydrology, Hydraulics, and Water Management Technical Report* in the Physical Resources Appendix for details).

The power generated by the CVP is marketed through contracts with Western. Western, created in 1977 under the U.S. Department of Energy Organization Act, markets and transmits electric power throughout 15 western states. Western's Sierra Nevada Customer Service Region (also known as the Sierra Nevada Region) markets and transmits power generated from the CVP and the Washoe Project in excess of CVP use.

The 2004 Marketing Plan for the Sierra Nevada Region specifies the terms and conditions under which Western markets power from the CVP and the Washoe Project that began on January 1, 2005. This marketing plan resulted in the existing power marketing contract between Western and the CVP that expires on December 31, 2024.

23.2.2 State

DWR is currently seeking a new 50-year hydroelectric license from the Federal Energy Regulatory Commission to operate the Oroville Facilities. The Final EIS and Final EIR are available for the general public review. The initial Federal Energy Regulatory Commission license for the Oroville Facilities, issued on February 11, 1957, expired on January 31, 2007. Currently, the Oroville Facilities are operating under a license that was issued by the Federal Energy

Regulatory Commission, effective February 1, 2007, and being renewed each year in anticipation of issuance of the new 50-year license.

23.2.3 Regional and Local

No known regional or local regulations govern power and energy resources.

23.3 Environmental Consequences and Mitigation Measures

The purpose of this section is to provide information about hydropower generation, energy use, and impacts on existing hydropower facilities from the SLWRI study alternatives described in the EIS. Hydropower modeling for the EIS was conducted to identify potential impacts from the SLWRI on hydropower generation and consumption at CVP and SWP facilities, which are operated by Reclamation and DWR, respectively. This section describes the analytical methodology used to calculate, for all alternatives, the hydropower generation and pumping energy required at existing CVP and SWP hydropower facilities. This chapter also describes criteria for determining significant impacts associated with the SLWRI alternatives, and lists those impacts.

23.3.1 Methods and Assumptions

Council on Environmental Quality regulations and the State CEQA Guidelines address NEPA and CEQA requirements for describing the potential environmental consequences of alternatives in an EIS and EIR, respectively. NEPA and CEQA requirements guide the assessments presented in this section. Appendix F of the State CEQA Guidelines addresses energy conservation, and NEPA directs that energy requirements and conservation potential are to be evaluated. This impact assessment is based on quantitative data regarding changes to hydropower resources that could occur under the program alternatives in geographic locales within the study area.

Several modeling tools were used for the SLWRI hydropower analysis. The CalSim-II model was used to simulate project operations and LongTermGen (LTGen), Version 1.18 and State Water Project Power (SWPPower), BST April 2010 Version power tools were used to quantify the hydropower generation and pumping energy associated with each alternative. A spreadsheet postprocessor was used to evaluate impacts to the Pit 7 Powerplant.

Power Modeling Tools

Energy estimates were made using the Benchmark Study Team (BST) power modeling tools LTGen, Version 1.18, and SWP Power, BST April 2010 Version, for CVP and SWP facilities, respectively. LTGen and SWP Power use operations data from CalSim-II simulations to predict energy generation and consumption throughout the CVP and SWP. Methods applied to evaluate power generation are discussed below.

For each alternative, outputs from CalSim-II simulation were input to LTGen and SWP Power, to simulate power generation and consumption throughout the CVP and SWP systems, respectively. These CalSim-II outputs included reservoir releases, conveyance flow rates, and end-of-month reservoir storage data. Both LTGen and SWP Power are monthly models. Their simulation periods are from October 31, 1921 to September 30, 2003.

In LTGen and SWP Power, energy generation is a function of turbine configuration, reservoir release, net head, and duration of generation. Net head is the actual head available for power generation; it is reservoir water surface elevation (a function of storage) minus tailrace elevation (a function of release).

Similarly, the calculation of energy required for pumping in both models is a function of pump configuration, pumping rate, pumping head (i.e., net head with hydraulic losses), and duration of pumping. Detailed descriptions of LTGen and SWP Power are included in Chapter 8 of the Modeling Appendix.

CalSim-II

CalSim-II is the application of the Water Resources Integrated Modeling System software to the CVP/SWP. This application was jointly developed by Reclamation and DWR for planning studies related to CVP/SWP operations. The primary purpose of CalSim-II is to evaluate the water supply reliability of the CVP and SWP at current and/or future levels of development (e.g., 2005 or 2030), with and without various assumed future facilities, and with different modes of facility operations. Geographically, the model covers the drainage basin of the Delta, and CVP/SWP exports to the San Francisco Bay Area, San Joaquin Valley, Central Coast, and Southern California.

CalSim-II typically simulates system operations for an 82-year period, using a monthly time step. The model assumes that facilities, land use, water supply contracts, and regulatory requirements are constant over this period, representing a fixed level of development (e.g., 2005 or 2030). The historical flow record from October 1921 to September 2003, adjusted for the influences of land use changes and upstream flow regulation, is used to represent the possible range of water supply conditions. Major Central Valley rivers, reservoirs, and CVP/SWP facilities are represented by a network of arcs and nodes. CalSim-II uses a mass balance approach to route water through this network. Simulated flows are mean flows for the month; reservoir storage volumes correspond to end-of-month storage.

Monthly CalSim-II model results are intended to be used for comparative purposes. It is important to differentiate between “absolute” or “predictive” modeling applications and “comparative” applications. In “absolute” applications, the model is run once to predict a future outcome; errors or assumptions in formulation, system representation, data, and operational criteria all contribute to total error or uncertainty in model results. In “comparative” applications, the model is run twice, once to represent a baseline condition (no

project) and a second time with a specific change (project) to assess the change in the outcome due to the input change. In this comparative mode (the mode used for this EIS), the difference between the two simulations is of principal importance. Potential errors or uncertainties that exist in the "no project" simulation are also present in the "project" simulation, such that their impacts are reduced when assessing the change in outcomes.

Spreadsheet Postprocessors

For analysis of impacts from each alternative on generation from the Pit 7 Powerplant, a spreadsheet postprocessor was used in lieu of a model. Since no model was available for Pit 7 Powerplant operations, an evaluation of potential impacts of the SLWRI alternatives, as simulated using CalSim-II on recent historical data, was used instead.

The spreadsheet postprocessor interpolated CalSim-II output for Shasta Reservoir storage to determine the reservoir water surface elevation. The water surface elevations for each alternative were compared to historical Pit 7 Powerplant tailwater elevations, to calculate the change in net head at the Pit 7 Powerplant. Changes in net head at the Pit 7 Powerplant were assumed to be small enough so that turbine/generator efficiencies would be unaffected. For each alternative, the monthly generation was determined by multiplying historical average monthly generation by the ratio of the alternative-reduced net head compared to the historical net head (assumed to be 200 feet, based on historical average) raised to the 1.5 power.

23.3.2 Criteria for Determining Significance of Effects

The thresholds of significance for impacts to power and energy are based on the environmental checklist in Appendix G of the State CEQA Guidelines, as amended. These thresholds also encompass the factors taken into account under NEPA to determine the significance of an action in terms of its context and the intensity of its impacts. An alternative would be considered to have a potentially significant impact on regional hydropower production if the change in the average annual energy generation or consumption (over the 82-year period of simulation) by the CVP/SWP is greater than 5 percent, as shown in Table 23-1.

A threshold of 5 percent was selected as the threshold of significance for hydroelectric generation for several reasons, including seasonal and annual hydrologic variability, short-term operations decisions that may affect water level in storage, and regional power market demands and prices that may dictate hydropower facilities operations. All these factors could contribute to potentially substantial variations in hydropower generation on a monthly or annual basis. As a result, generation variations of less than 5 percent would not be considered significant. Significance statements are relative to both existing conditions (2005) and future conditions (2030), unless stated otherwise.

Table 23-1. Impact Indicators and Significance Criteria for Energy Generation and Usage

Impact Indicator	Significance Criterion
Shasta Powerplant Energy Generation	Decrease in average annual Shasta Powerplant hydropower generation of more than 5 percent.
CVP System Energy Generation	Decrease in average annual CVP system hydropower generation of more than 5 percent.
SWP System Energy Generation	Decrease in average annual SWP system hydropower generation of more than 5 percent.
CVP System Pumping Energy Use	Increase in average annual CVP system pumping energy use of more than 5 percent.
SWP System Pumping Energy Use	Increase in average annual SWP system pumping energy use of more than 5 percent.
Pit 7 Powerplant Energy Generation	Decrease in average annual Pit 7 hydropower generation of more than 5 percent.

Key:
CVP = Central Valley Project
SWP = State Water Project

Shasta Powerplant Energy Generation

Changes in Shasta Powerplant operations due to any of the SLWRI alternatives could directly affect hydropower generation caused by changes in head and flow available for hydropower generation. A significant reduction in energy generation at Shasta Powerplant could require purchase of energy to meet CVP pumping energy demands, or a reduction in power revenue.

CVP System Energy Generation

Changes in CVP operations due to any of the SLWRI alternatives could result in reoperation of other CVP hydropower generation facilities, and could result in a systemwide decrease in CVP hydropower generation. A significant reduction in CVP energy generation could require purchase of energy to meet CVP pumping energy demands, or a reduction in power revenue.

SWP System Energy Generation

Changes in SWP operations due to any of the SLWRI alternatives could result in reoperation of SWP generation facilities, and could result in a systemwide decrease in SWP hydropower generation. A significant reduction in SWP energy generation could require purchase of energy to meet SWP pumping energy demands, or a reduction in power revenue.

CVP Pumping Energy Use

Changes in CVP operations due to any of the SLWRI alternatives could result in changes in operations of the CVP pumping plants. A significant increase in CVP system pumping energy use could require purchase of energy to meet CVP pumping energy demands, or a reduction in power revenue.

SWP Pumping Energy Use

Changes in SWP operations due to any of the SLWRI alternatives could result in changes in operations of the SWP pumping plants. A significant increase in SWP system pumping energy use could require purchase of energy to meet SWP pumping energy demands, or a reduction in power revenue.

Pit 7 Powerplant Energy Generation

The Pit 7 Powerplant is owned and operated by the Pacific Gas and Electric Company. Increases in Shasta Lake water surface elevations could increase the tailwater elevation below the Pit 7 Powerplant, reducing the net head and decreasing generation.

23.3.3 Direct and Indirect Effects

This section describes the environmental consequences of the SLWRI comprehensive plans, and proposed mitigation measures for any impacts determined to be significant or potentially significant. All comprehensive plans are compared to a baseline to allow evaluation of potential impacts. For the existing condition, a 2005 level of development CalSim-II simulation without any Shasta enlargement is used as baseline. Similarly, for the future condition a 2030 level of development CalSim-II simulation, the No-Action Alternative, is used as a baseline. Each of the comprehensive plans where simulated using the same levels of development. This was done so that any changes from the baseline hydropower generation or consumption can be attributed to the alternative. Detailed tables of the monthly energy generation and energy consumption associated with each comprehensive plan are included in Attachment 18 of the Modeling Appendix.

The No-Action Alternative and the SLWRI comprehensive plans are described in the following subsections. Potential effects of the existing condition, No-Action Alternative, and various SLWRI comprehensive plans on energy generation and usage are also described.

No-Action Alternative

Under the No-Action Alternative, the Federal government would take reasonably foreseeable actions, as discussed in Chapter 2, “Alternatives,” but would take no additional action toward implementing a specific plan to help increase anadromous fish survival in the upper Sacramento River, nor would help address the growing water reliability issues in California. Shasta Dam would not be modified, and the CVP would continue operating similar to the existing condition. Changes in regulatory conditions and water supply demands would result in differences in flows on the Sacramento River and in the Delta between existing and future conditions. Possible changes include the following:

- Firm Level 2 Federal refuge deliveries
- SWP deliveries based on full Table A amounts
- Full implementation of the Grassland Bypass Project
- Implementation of salinity management actions similar to the Vernalis Adaptive Management Plan

- Implementation of the South Bay Aqueduct Improvement and Enlargement Project
- Increased San Joaquin River diversions for water users in the Stockton Metropolitan Area after completion of the Delta Water Supply Project
- Increased Sacramento River diversions by Freeport Regional Water Project agencies
- San Joaquin River Restoration Program Full Restoration Flows

This alternative is used as a basis of comparison for future condition comparisons. Table 23-2 summarizes the simulated average annual hydropower generation and energy use for the No-Action Alternative.

Table 23-2. Simulated Average Annual Energy Generation and Use for No-Action Alternative

	Existing (GWh)	No Action (GWh)	Change (GWh)	Percent Change
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,154	3	0%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	4,914	-13	0%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,513	86	2%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,184	-17	-1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,933	333	4%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	529	0	0%

Note: Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (No-Action): Decrease in Shasta Powerplant Energy Generation Simulated annual average Shasta Powerplant energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual generation of 3 gigawatt-hour (GWh) (0 percent). This impact would be beneficial. Mitigation is not required for the No-Action Alternative.

Impact Hydro-2 (No-Action): Decrease in CVP System Energy Generation Simulated average annual CVP system energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be a decrease in simulated average annual energy generation of 12 GWh (0 percent). This impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Hydro-3 (No-Action): Decrease in SWP System Energy Generation Simulated average annual CVP system energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual energy generation of 86 GWh (2 percent). This impact would be beneficial. Mitigation is not required for the No-Action Alternative.

Impact Hydro-4 (No-Action): Increase in CVP System Pumping Energy Use Simulated average annual CVP pumping energy use for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual pumping energy use of 17 GWh (1 percent). This impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Hydro-5 (No-Action): Increase in SWP System Pumping Energy Use Simulated average annual SWP pumping energy use for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be an increase in simulated average annual pumping energy use of 333 GWh (4 percent). This impact would be less than significant. Mitigation is not required for the No-Action Alternative.

Impact Hydro-6 (No-Action): Decrease in Pit 7 Powerplant Energy Generation Simulated average annual Pit 7 Powerplant energy generation for the No-Action Alternative is shown in Table 23-2. Under the No-Action Alternative, there would be no change in simulated average annual energy generation at the Pit 7 Powerplant. Therefore, no impact would occur. Mitigation is not required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

CP1 focuses on increasing water supply reliability and increasing anadromous fish survival. This plan primarily consists of raising Shasta Dam by 6.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 8.5 feet and enlarge the total storage capacity in the reservoir by 256,000 acre-feet. The existing temperature control device (TCD) would also be extended to achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years[3] and critical years, when 70,000 acre-feet and 35,000

[3] Throughout this document, water year types are defined according to the Sacramento Valley Index Water Year Hydrologic Classification unless specified otherwise.

acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP1 would help reduce future water shortages by increasing drought year and average year water supply reliability for agricultural, and municipal and industrial (M&I) deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River. Table 23-3 summarizes the simulated average annual hydropower generation and energy use for CP1.

Table 23-3. Simulated Average Annual Energy Generation and Use for CP1

	Existing (GWh)	CP1 (GWh)	Change		Future (GWh)	CP1 (GWh)	Change	
			(GWh)	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Energy Generation	2,151	2,191	40	2%	2,154	2,194	40	2%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	4,966	39	1%	4,914	4,955	40	1%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,440	13	0%	4,513	4,527	14	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,203	3	0%	1,184	1,191	7	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,642	42	1%	7,933	7,979	46	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	524	-4	-1%	529	525	-4	-1%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP1): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual generation under both existing and future levels of 40 GWh (2 percent). In addition to increased hydropower generation, CP1 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP1): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual

energy generation of 39 GWh (1 percent) and 40 GWh (1 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP1): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual energy generation of 13 GWh (0 percent) and 14 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP1): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual pumping energy use of 3 GWh (0 percent) and 7 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP1): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP1 is shown in Table 23-3. Under CP1, there would be an increase in simulated average annual pumping energy use of 42 GWh (1 percent) and 46 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP1): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 generation for CP1 is shown in Table 23-3. Under CP1, the 6.5-foot Shasta Dam raise option, the operating range of net head would decrease from about 173 to 204 feet to about 168 to 193 feet, an approximately 4 percent decrease in net head. Under CP1, there would be a decrease in simulated average annual generation of about 4 GWh (1 percent) and 4 GWh (1 percent) under existing and future levels, respectively. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 Dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

As with CP1, CP2 focuses on increasing water supply reliability and increasing anadromous fish survival. CP2 primarily consists of raising Shasta Dam by 12.5 feet, which, in combination with spillway modifications, would increase the height of the reservoir's full pool by 14.5 feet and enlarge the total storage capacity in the reservoir by 443,000 acre-feet. The existing TCD would also be extended to achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 120,000 acre-feet and 60,000 acre-feet,

respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP2 would help reduce future water shortages by increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River. Table 23-4 summarizes the simulated average annual hydropower generation and energy use for CP2.

Table 23-4. Simulated Average Annual Energy Generation and Use for CP2

	Existing (GWh)	CP2 (GWh)	Change		Future (GWh)	CP2 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,221	70	3%	2,154	2,221	67	3%
Impact Hydro- 2 – Decrease in CVP System Energy Generation	4,927	4,998	71	1%	4,914	4,983	69	1%
Impact Hydro- 3 – Decrease in SWP System Energy Generation	4,427	4,444	17	0%	4,513	4,535	22	0%
Impact Hydro- 4 – Increase in CVP System Pumping Energy Use	1,201	1,206	5	1%	1,184	1,194	10	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,660	60	1%	7,933	8,005	72	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	520	-9	-2%	529	522	-7	-1%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP2): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual generation of 70 GWh (3 percent) and 67 GWh (3 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP2 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the

ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP2): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual energy generation of 71 GWh (1 percent) and 69 GWh (1 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP2): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual energy generation of 17 GWh (0 percent) and 22 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP2): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual pumping energy use of 5 GWh (1 percent) and 10 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP2): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP2 is shown in Table 23-4. Under CP2, there would be an increase in simulated average annual pumping energy use of 60 GWh (1 percent) and 72 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP2): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 generation for CP2 is shown in Table 23-4. Under CP2 the operating range of net head would decrease from about 173 to 204 feet to about 168 to 193 feet, an approximately 4 percent decrease in net head. Under CP2, there would be a decrease in simulated average annual generation of about 9 GWh (2 percent) and 7 GWh (1 percent) under existing and future levels, respectively. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival

CP3 focuses on increasing agricultural water supply reliability while also increasing anadromous fish survival. This plan primarily consists of raising Shasta Dam by 18.5 feet, which, in combination with spillway modifications,

would increase the height of the reservoir's full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet. The existing TCD would also be extended to achieve efficient use of the expanded cold-water pool. Because CP3 focuses on increasing agricultural water supply reliability, none of the increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, with the additional storage retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. Simulations of CP3 did not involve any changes to the modeling logic for deliveries or flow requirements; all rules for water operations were updated to include the new storage but were not otherwise changed. Table 23-5 summarizes the simulated average annual hydropower generation and energy use for CP3.

Table 23-5. Simulated Average Annual Energy Generation and Use for CP3

	Existing (GWh)	CP3 (GWh)	Change		Future (GWh)	CP3 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,248	97	5%	2,154	2,249	95	4%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,025	98	2%	4,914	5,009	95	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,429	2	0%	4,513	4,508	-5	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,214	13	1%	1,184	1,209	25	2%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,606	6	0%	7,933	7,917	-16	0%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	514	-15	-3%	529	514	-15	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP3): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual generation of 97 GWh (5 percent) and 95 GWh (4 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP3 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the

ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP3): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual energy generation of 98 GWh (2 percent) and 95 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP3): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual energy generation of 2 GWh (0 percent) under the existing level and a decrease of 5 GWh (0 percent) under the future level. This impact would be beneficial under the existing level and less than significant under the future level. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP3): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual pumping energy use of 13 GWh (1 percent) and 25 GWh (2 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP3): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP3 is shown in Table 23-5. Under CP3, there would be an increase in simulated average annual pumping energy use of 6 GWh (0 percent) under the existing level and a decrease of 16 GWh (0 percent) under the future level. This impact would be beneficial under the existing level and less than significant under the future level. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP3): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 Powerplant generation for CP3 is shown in Table 23-5. Under CP3 the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP3, there would be a decrease in simulated average annual generation of 15 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

CP4 and CP4A focus on increasing anadromous fish survival while also increasing water supply reliability. By raising Shasta Dam 18.5 feet, in combination with spillway modifications, CP4 or CP4A would increase the height of the reservoir full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet. The existing TCD would also be extended to achieve efficient use of the expanded cold-water pool. The additional storage created by the 18.5-foot dam raise would be used to improve the ability to meet temperature objectives and habitat requirements for anadromous fish during drought years and increase water supply reliability.

For CP4, about 378,000 acre-feet of the increased reservoir storage space, would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. Operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as for CP1, with 70,000 acre-feet and 35,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4 also includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River for fisheries benefit. Table 23-6 summarizes the simulated average annual hydropower generation and energy use for CP4.

Table 23-6. Simulated Average Annual Energy Generation and Use for CP4

	Existing (GWh)	CP4 (GWh)	Change		Future (GWh)	CP4 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,269	118	5%	2,154	2,273	119	6%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,044	117	2%	4,914	5,033	119	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,440	13	0%	4,513	4,527	14	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,203	3	0%	1,184	1,191	7	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,642	42	1%	7,933	7,979	46	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	513	-16	-3%	529	513	-16	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

For CP4A, about 191,000 acre-feet of the increased reservoir storage space, would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. Operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as for CP2, with 120,000 acre-feet and 60,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4A also includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River for fisheries benefit. Table 23-7 summarizes the simulated average annual hydropower generation and energy use for CP4A.

Table 23-7. Simulated Average Annual Energy Generation and Use for CP4A

	Existing (GWh)	CP4A (GWh)	Change		Future (GWh)	CP4A (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2151	2261	110	5%	2154	2261	107	5%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,037	111	2%	4,914	5,023	109	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4427	4444	17	0%	4513	4535	22	0%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,206	5	1%	1,184	1,194	10	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7600	7660	60	1%	7933	8005	72	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	513	-15	-3%	529	514	-15	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP4 and CP4A): Decrease in Shasta Powerplant Energy Generation Simulated average annual Shasta Powerplant energy generation for CP4 is shown in Table 23-6 and in Table 23-7 for CP4A.

Under CP4, there would be an increase in simulated average annual generation of 118 GWh (5 percent) and 119 GWh (6 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP4 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

Under CP4A, there would be an increase in simulated average annual generation of 110 GWh (5 percent) and 107 GWh (5 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP4A would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP4 and CP4A): Decrease in CVP System Energy Generation Simulated average annual CVP system generation for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual energy generation of 117 GWh (2 percent) and 119 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual CVP system generation for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual energy generation of 111 GWh (2 percent) and 109 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP4 and CP4A): Decrease in SWP System Energy Generation Simulated average annual SWP system generation for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual energy generation of 13 GWh (0 percent) and 14 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual CVP system generation for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual energy generation of 17 GWh (0 percent) and 22 GWh (0 percent) under existing and future levels, respectively. This impact would be beneficial for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP4 and CP4A): Increase in CVP System Pumping Energy Use Simulated average annual CVP pumping energy use for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual pumping energy use of 3 GWh (0 percent) and 7 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual CVP pumping energy use for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual pumping energy use of 5 GWh (1 percent) and 10 GWh (1 percent)

under existing and future levels, respectively. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP4 and CP4A): Increase in SWP System Pumping Energy Use Simulated average annual SWP pumping energy use for CP4 is shown in Table 23-6. Under CP4, there would be an increase in simulated average annual pumping energy use of 42 GWh (1 percent) under both the existing and future levels. This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual SWP pumping energy use for CP4A is shown in Table 23-7. Under CP4A, there would be an increase in simulated average annual pumping energy use of 60 GWh (1 percent) and 72 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP4 and CP4A): Decrease in Pit 7 Powerplant Energy Generation Simulated average annual Pit 7 Powerplant generation for CP4 is shown in Table 23-6. Under CP4 the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP4, there would be a decrease in simulated average annual generation of 16 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Simulated average annual Pit 7 Powerplant generation for CP4A is shown in Table 23-7. Under CP4A the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP4A, there would be a decrease in simulated average annual generation of 15 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

CP5 primarily focuses on increasing water supply reliability, anadromous fish survival, Shasta Lake area environmental resources, and recreation opportunities. By raising Shasta Dam 18.5 feet, in combination with spillway modifications, CP5 would increase the height of the reservoir full pool by 20.5 feet and enlarge the total storage capacity in the reservoir by 634,000 acre-feet. The existing TCD would be extended to achieve efficient use of the expanded cold-water pool. Shasta Dam operational guidelines would continue essentially

unchanged, except during dry years and critical years, when 150,000 acre-feet and 75,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP5 also includes constructing additional fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries; augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake. CP5 would help reduce future water shortages by increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River. Table 23-8 summarizes the simulated average annual hydropower generation and energy use for CP5.

Table 23-8. Simulated Average Annual Energy Generation and Use for CP5

	Existing (GWh)	CP5 GWh)	Change		Future (GWh)	CP5 (GWh)	Change	
			GWh	Percent			GWh	Percent
Impact Hydro-1 – Decrease in Shasta Powerplant Energy Generation	2,151	2,247	96	4%	2,154	2,247	93	4%
Impact Hydro-2 – Decrease in CVP System Energy Generation	4,927	5,021	95	2%	4,914	5,007	93	2%
Impact Hydro-3 – Decrease in SWP System Energy Generation	4,427	4,449	22	0%	4,513	4,537	24	1%
Impact Hydro-4 – Increase in CVP System Pumping Energy Use	1,201	1,207	7	1%	1,184	1,200	16	1%
Impact Hydro-5 – Increase in SWP System Pumping Energy Use	7,600	7,674	74	1%	7,933	8,018	85	1%
Impact Hydro-6 – Decrease in Pit 7 Powerplant Energy Generation	529	514	-15	-3%	529	514	-15	-3%

Note:
Change and no action values may not sum to existing values due to rounding.
Key:
% = percent
CP = Comprehensive Plan
CVP = Central Valley Project
GWh = gigawatt-hour
SWP = State Water Project

Impact Hydro-1 (CP5): Decrease in Shasta Powerplant Energy Generation
Simulated average annual Shasta Powerplant energy generation for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual generation of 96 GWh (4 percent) and 93 GWh (4 percent) under existing and future levels, respectively. In addition to increased hydropower generation, CP5 would provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-2 (CP5): Decrease in CVP System Energy Generation
Simulated average annual CVP system generation for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual energy generation of 95 GWh (2 percent) and 93 GWh (2 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-3 (CP5): Decrease in SWP System Energy Generation
Simulated average annual SWP system generation for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual energy generation of 22 GWh (0 percent) and 24 GWh (1 percent) under existing and future levels, respectively. This impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-4 (CP5): Increase in CVP System Pumping Energy Use
Simulated average annual CVP pumping energy use for CP5 is shown in Table 23-8. Under CP5, there would be an increase in simulated average annual pumping energy use of 7 GWh (1 percent) and 16 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-5 (CP5): Increase in SWP System Pumping Energy Use
Simulated average annual SWP pumping energy use for CP5 is shown in Table 23-7. Under CP5, there would be an increase in simulated average annual pumping energy use of 74 GWh (1 percent) and 85 GWh (1 percent) under existing and future levels, respectively. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact Hydro-6 (CP5): Decrease in Pit 7 Powerplant Energy Generation
Simulated average annual Pit 7 Powerplant generation for CP5 is shown in Table 23-8. Under CP5 the operating range of net head would decrease to about 156 to 181 feet, an approximate 10 percent reduction in net head. Under CP5, there would be a decrease in simulated average annual generation of 15 GWh (3 percent) under both the existing and future levels. Reclamation will provide in kind power in a method that will be determined after congressional authorization, to offset the reduced generation at Pit 7 dam and facilities. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

23.3.4 Mitigation Measures

Table 23-9 presents a summary of impacts and mitigation measures for power and energy. No potentially significant impacts have been identified; therefore, no mitigation is required.

Table 23-9. Summary of Impacts and Mitigation Measures – Power and Energy

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact Hydro-1: Decrease in Shasta Powerplant Energy Generation	LOS before Mitigation	B	B	B	B	B	B
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	B	B	B	B	B	B
Impact Hydro-2: Decrease in CVP System Energy Generation	LOS before Mitigation	LTS	B	B	B	B	B
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	LTS	B	B	B	B	B
Impact Hydro-3: Decrease in SWP System Energy Generation	LOS before Mitigation	B	B	B	LTS	B	B
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	B	B	B	LTS	B	B
Impact Hydro-4: Increase in CVP System Pumping Energy Use	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Hydro-5: Increase in SWP System Pumping Energy Use	LOS before Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	LTS	LTS	LTS	LTS	LTS	LTS
Impact Hydro-6: Decrease in Pit 7 Powerplant Energy Generation	LOS before Mitigation	NI	LTS	LTS	LTS	LTS	LTS
	Mitigation Measure	None required	No mitigation needed; thus, none proposed.				
	LOS after Mitigation	NI	LTS	LTS	LTS	LTS	LTS

Key:
B = Beneficial
CP = Comprehensive Plan
CVP = Central Valley Project
LOS = Level of Significance
LTS = Less than Significant
SWP = State Water Project

23.3.5 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," discusses overall cumulative impacts methodology related to the action alternatives, including the relationship to the CALFED Bay-Delta Program Programmatic EIS/EIR cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," lists the present and reasonably foreseeable future projects considered quantitatively and qualitatively within the cumulative impacts analysis.

Actions which are included quantitatively in this cumulative effects analysis are those that are reasonably foreseeable, including actions with current authorization, secured funding for design and construction, and environmental permitting and compliance activities that are substantially complete. As described in Chapter 2, "Alternatives," Section 2.2, "No-Action Alternative," the NEPA No-Action alternative includes all reasonably foreseeable actions

included quantitatively in the cumulative effects analysis, but excludes effects for project actions. The future with-project conditions combine project actions with the actions included in the No-Action Alternative (2030 baseline). Therefore, quantitative impact assessments for the future with-project conditions presented in this chapter in Section 23.3.3, "Direct and Indirect Effects," also serve as the quantitative impacts assessments for the cumulative effects analysis. A list of projects included in the Final EIS No-Action Alternative and future with-project impact analyses is located in the Modeling Appendix, Chapter 2, Table 2-1.

Past and present projects that have affected power and energy resources in the primary and extended study area include new hydropower projects, FERC hydropower relicensing projects, regulatory actions, and fisheries flow requirements. Projects which do not meet the parameters of reasonably foreseeable for inclusion in this quantitative cumulative effects analysis but which may have past, present, or reasonably foreseeable cumulative impacts in combination with the proposed project may be included in the cumulative impacts analysis qualitatively. Projects and actions considered include, but are not limited to, the San Joaquin River Restoration Program, Bay Delta Conservation Plan (BDCP), Yuba Salmon Forum Fish Passage Program, Increased Hydropower Generation Capacity at Lewiston Dam, PG&E Pit River 3,4 and 5 Hydroelectric Projects License Implementation, PG&E McCloud and Pit Rivers 6 and 7 FERC relicensing projects and the DWR Oroville Facilities FERC Relicensing.

The effects of climate change on operations at Shasta Lake could potentially result in changes to power and energy. As described in the Climate Change Modeling Appendix, climate change could result in higher reservoir releases in the winter and early spring due to an increase in runoff during these times. Similarly, climate change could result in lower reservoir inflows and Sacramento tributary flows during the late spring and summer due to a decreased snow pack. This reduction in inflow and tributary flow could result in Shasta Lake storage being reduced due to both a reduced ability to capture flows and an increased need to make releases to meet downstream requirements.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP1. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. Additionally, several of the projects listed in Table

3-1 would have an impact on energy generation and energy use, such as the BDCP and various FERC relicensing projects. CP1 has an overall net negative energy value; therefore CP1 would make a cumulatively considerable incremental contribution to a significant cumulative impact on energy consumption and generation.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP1 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP1 having a significant cumulative impact.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP2. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP2 has a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP2 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP2 having a significant cumulative impact.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the

Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP3. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP3 has a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP3 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP3 having a significant cumulative impact.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus With Water Supply Reliability

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP4 or CP4A. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP4 and CP4A have a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP4 or CP4A would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP4 or CP4A having a significant cumulative impact.

CP5 – 18.5-Foot Dam Raise, Combination Plan

When combined with other past, present, and reasonably foreseeable future projects, a change in river flows and reservoir elevations would be likely. Since Shasta Reservoir is operated to meet flow and water quality requirements in the Sacramento River and Delta, any new project or program along the Sacramento River and in the Delta could potentially impact the CVP and SWP facility hydropower generation and consumption of CP5. With the implementation of many of the projects, Shasta Reservoir could be reoperated, which would result in changes to the Sacramento River flow regime and reservoir elevations, and could cause a potentially significant impact on CVP/SWP facility hydropower generation and consumption. However, CP5 has a net beneficial impact on energy consumption and energy generation and therefore would not have a cumulatively considerable incremental contribution to the significant cumulative impact.

As stated previously, effects of climate change on operations of Shasta Lake could include increased inflows and releases at certain times of the year, and decreased inflows and storage at other times. The additional storage associated with CP5 would potentially diminish these effects and allow Shasta Lake to capture some of the increased runoff in the winter and early spring for release in late spring and summer. Additionally, the increased storage volume would allow Shasta Lake to maintain greater storage and potentially greater hydropower generation. Therefore, the addition of anticipated effects of climate change would not result in CP5 having a significant cumulative impact.

Chapter 24
Environmental Justice

24.1 Affected Environment

24.1.1 Minority and Low-Income Populations

The environmental setting of a project area can be viewed from both a geographic perspective and a human perspective. The physical environment provides a geographical context for the populations to be evaluated in this EIS. The human perspective encompasses race, ethnic origin, and economic status of affected groups.

The intent of an environmental justice evaluation under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* (1994), is to identify communities and groups that meet environmental justice criteria, and suggest strategies to reduce potential adverse impacts of projects on affected groups.

In its guide to environmental justice under NEPA, the Council on Environmental Quality (CEQ) (1997) encourages agencies to consider all of the following groups in the scoping process:

- Religious organizations
- Newspapers, radio, and other media
- Civic associations
- Minority business associations
- Environmental and environmental justice organizations
- Legal aid providers
- Homeowners', tenants', and neighborhood watch groups
- Federal, State, local, and tribal governments
- Rural cooperatives
- Business and trade organizations

- Community and social service organizations
- Universities, colleges, vocational, and other schools
- Labor organizations
- Civil rights organizations
- Local schools and libraries
- Senior citizens' groups
- Public health agencies and clinics

Shasta Lake and Vicinity

This section reviews minority and low-income communities situated near the reservoir, and those that directly depend on it for social, economic, cultural, historic, occupational, recreational, or other needs deemed significant by these communities.

County-level data are used for this analysis given the large size of the project impact area comprised largely of rural areas and the fact that localized areas within the counties are not likely to differ appreciably in their minority and low-income population makeup. For example, the closest incorporated city to Shasta Dam within Shasta County is the City of Shasta Lake. Shasta Lake's percentage of minority (nonwhite) residents in 2010 was 13.9 percent, compared to 16.6 percent for the county as a whole, and the percentage of low-income residents in Shasta Lake was 20.5 percent compared to 15.5 percent for the county as a whole.

Table 24-1 depicts a historically white population in Shasta County that is slowly diversifying and income levels consistently below the statewide average, resulting in relatively higher poverty rates among all ethnic groups. In 2010, the population of Shasta County was approximately 16.6 percent minority (nonwhite) and approximately 17.7 percent low-income, compared to statewide populations of 42.4 percent minority and 15.5 percent low-income. The slightly higher local poverty rate is not meaningfully greater than the statewide rate.

Lakehead-Lakeshore Community The Lakehead-Lakeshore community is located along Shasta Lake's northernmost reach, the Sacramento River Arm. Lakehead, an unincorporated seasonal community of approximately 1,500 residents (U.S. Census Bureau 2010a), is adjacent to Interstate 5 and includes typical services found near a major interstate highway. Lakehead provides a variety of campgrounds, boat ramps, and marinas. The Lakehead community includes low-income and minority residents and workers who could be affected by project construction and changes in outdoor recreation patterns resulting from the project.

Tourism and Outdoor Recreation Industry Shasta Lake and its vicinity are recreation destinations that draw visitors from throughout California. Most facilities in the area depend on Shasta Lake to draw visitors and customers. The tourism and outdoor recreation service industries are included in this discussion because this group includes a community of lower-paid service workers that could be affected by project actions related to Shasta Dam. A change in recreation opportunities could affect employment and revenue patterns, as well as social and recreational opportunities for minority or low-income residents. With the exception of Lakehead, the settlement and recreation-related development along Shasta Lake falls within unincorporated Shasta County. Residents and workers are dispersed throughout Shasta County, and affected minority and low-income communities are reflected in demographic data for Shasta County as shown in Table 24-1.

Table 24-1. Ethnicity, Income, and Poverty Trends in Shasta and Tehama Counties and California

Topic	Shasta County	Tehama County	State of California
Race/Ethnicity			
White, 2010	153,726	51,721	21,453,934
White, 2000–2010 (% change)	5.4	8.8	6.4
Black or African American, 2010	1,548	406	2,299,072
Black or African American, 2000–2010 (% change)	26.4	27.7	1.6
American Indian, including Alaskan Natives, 2010	4,950	1,644	362,801
American Indian, including Alaskan Natives, 2000–2010 (% change)	9.3	41.3	8.8
Asian or Pacific Islander, 2010	4,662	732	5,005,393
Asian or Pacific Islander, 2000–2010 (% change)	37.0	47.9	31.2
Two or more races (total), 2010	7,846	2,702	1,815,384
Two or more races (total), 2000–2010 (% change)	38.6	42.3	12.9
Hispanic Origin (any race), 2010	14,878	13,906	14,013,719
Hispanic Origin (any race), 2000–2010 (% change)	65.3	56.8	27.8

Table 24-1. Ethnicity, Income, and Poverty Trends in Shasta and Tehama Counties and California (contd.)

Topic	Shasta County	Tehama County	State of California
Income/Poverty			
Median Household Income, 2000	$34,335	$31,206	$47,493
Median Household Income, 2010	$42,931	$39,392	$59,641
% Change, 2000–2010	25.0	26.2	25.5
% of Individuals Below Poverty Level, 2000	15.4	17.3	14.2
% of Individuals Below Poverty Level, 2010	17.7	19.5	15.5
% Change, 2000–2010	2.3	2.2	1.3
% of Children (< 18) Below Poverty Level, 2000	21.0	24.0	19.0
% of Children (< 18) Below Poverty Level, 2010	23.4	27.9	21.6
% Change, 2000–2010	2.4	3.9	2.6

Sources: U.S. Census Bureau 2002a, 2002b, 2002c, 2009a, 2010b

Areas of Native American Concern As described in Chapter 14, "Cultural Resources," the Sacramento River and its major tributaries, particularly the Pit and McCloud rivers, were the focus of intensive Native American occupation during historic times, with a variety of religious, economic, historic, and other values identified here for Native American groups. Ten groups, including those listed by the Native American Heritage Commission, represent Native American interests in the study area. They include Grindstone Indian Rancheria, Paskenta Band of Nomlaki Indians, Pit River Environmental Council, Pit River Tribe of California, Redding Rancheria, Shasta Nation, United Tribe of Northern California, Inc., Winnemem Wintu Tribe, Wintu Educational and Cultural Council, and the Wintu Tribe of Northern California.

The Winnemem Wintu have identified important localities within the study area, many of which are locations where ceremonies are regularly conducted. Along the McCloud River, these include Children's Rock, Coyote Rock, Dekkas Rock, doctoring pools near Nawtawaket Creek, Eagle Rock and Samwel Cave, Hirz Bay, *Kaibai* village, North Gray Rocks, Puberty Rock, Saddle Rock, and *Watawacket* village and spiritual area. Along the Sacramento River, important localities include the Antlers area, Delta area, Doney Creek, Gregory Creek, LaMoine area, Packers Bay, Pollard's area, middle Salt Creek, and Sims area. The Winnemem Wintu have strong traditional and contemporary connections with the land, and their ongoing use of many archaeological and religious sites is fundamental to the well-being of their culture, particularly the education of their youth.

The Winnemem Wintu have also documented the location of some 155 ancestral villages within the Shasta Lake area. At least 81 village locations are known along the lower McCloud River and lower Pit River. An additional 73 villages are known to have existed on the east side of the Sacramento River. These village locations once contained between one and 30 houses each, some had associated cemeteries and each had a power place. Some of these villages are already under the waters of Shasta Lake, while others are just above the current Shasta Lake water level. The Winnemem Wintu have estimated that 120 of the known villages are still accessible (above the current high-water line).

Members of the Pit River Madesi Band stated that 22 ethnographic villages and associated burial grounds are located within the existing reservoir and proposed reservoir areas. One tribal member also noted that several Traditional Cultural Properties (TCP) exist within the Pit 6 and Pit 7 Dam areas.

Upper Sacramento River (Shasta Dam to Red Bluff)

Many social and public services are provided and a range of resource-dependent cultural activities take place in the cities of Shasta Lake, Redding, Anderson, Cottonwood, and Red Bluff. Each of these communities could be affected during project operation as a result of improved flood protection, enhanced water supply reliability, and increased recreational opportunities and spending related to improved salmonid habitat. Redding and Shasta County may be most affected because local residents, businesses, public services, and fiscal resources likely would also be affected by construction-related spending and activities.

Groups affected by the project could include minority and low-income populations such as transient and seasonal workers, Native American and Hispanic/Latino populations, and low-income water and electric utility customers. In 2010, the population of Tehama County was approximately 18.0 percent minority (nonwhite) and 19.5 percent low-income, compared to statewide populations of 42.4 percent minority and 15.5 percent low-income (Table 24-1). Poverty levels in Shasta and Tehama counties were exceeding statewide levels in 2010.

These groups often share the need for a reliable income and low costs of living, access to steady jobs, the need to protect the profitability of businesses that affect their personal income, access to high-quality public services, access to affordable and diverse housing, and a desire to enjoy a high quality of life.

Minority and low-income populations in the upper Sacramento River portion of the primary study area, many of which are employed by local agricultural operations, are especially susceptible to changes in employment opportunities. Changes in water and power supply reliability or delivery costs can have a major effect on the cost of living and on the operating costs and financial health of local businesses and employers. Changes in the frequency and duration of flooding along the Sacramento River and in the Delta also could affect agricultural operations and business owners and employees.

Lower Sacramento River and Delta

As discussed in Chapter 16, "Socioeconomics, Population, and Housing," this portion of the extended study area includes Red Bluff, the largest city in Tehama County with a population of 13,825 in 2010, and nine counties to the south. In 2010, the population of those nine counties totaled 4,226,027 (DOF 2010). The minority population of the nine counties was 42.6 percent overall, which is approximately the same as the statewide populations of 42.4 percent. Glenn County had the lowest proportion of minority populations, while Sacramento and San Joaquin counties had the highest proportion (U.S. Census Bureau 2010c). In 2010, poverty levels in the region ranged from 10 percent to 20 percent, with low-income populations exceeding the 15.5 percent state poverty level in Butte, Glenn, Sacramento, San Joaquin, and Yolo counties (U.S. Census Bureau 2009b).

Regional employment and labor trends are generally consistent with statewide trends. In 2010, approximately 15.6 percent of the labor force in the nine-county area was unemployed, compared to 7.7 percent statewide (U.S. Census Bureau 2009b). Butte, Colusa, Sacramento, San Joaquin, Solano, and Sutter counties registered higher unemployment rates than California as a whole. The counties with the highest unemployment rates in 2010 were characterized by greater dependence on the agricultural industry and less industrial diversity. Five of the six counties with unemployment rates above the statewide average maintained more than 60 percent of their land mass in agricultural production. Unemployment rates tend to be higher in rural areas than in urban areas because farm work is typically seasonal or temporary.

The lower Sacramento River region becomes increasingly urbanized as the river flows past the city of Sacramento and toward the Delta. Along its course, the river passes through low-density agricultural and suburban metropolitan areas and near high-density centers of commerce and culture such as Sacramento. In the Delta, a complex network of highways and urban infrastructure is integrated with canals, dikes, and levees. Heavily engineered water control and conveyance systems have promoted and sustained a successful agriculture industry and protected the region against damaging floods.

CVP/SWP Service Areas

The CVP and SWP service areas include 36 of California's 58 counties, accounting for 91 percent (38,648,090 residents) of California's population in 2010 (DOF 2010). Minority groups have been steadily increasing and such ethnic diversification is expected to continue. As shown in Table 24-1, the population of individuals in California identifying themselves as Asian–Pacific Islander or multiracial experienced double-digit population growth, while those identifying themselves as Black or African American experienced the least amount of growth between 2000 and 2010 (U.S. Census Bureau 2010b). Hispanics are the most numerous minority group in California, and many members of this ethnic group work on farms that receive some or all of their

water from the CVP. In general, rural agricultural counties have smaller minority populations than urban counties.

Poverty levels for both individuals and children increased slightly between 2000 and 2010. The percentage of people below the poverty level is expected to follow national and statewide economic trends. Generally, poverty rates tend to be higher in rural counties than in urban counties. Despite these differences, each of California's major urban areas has pockets of low-income neighborhoods with high poverty (and unemployment) rates. Minority and low-income communities that might be affected by the project include communities adjacent to construction projects, gateway and service communities providing support to construction-related activities, and low-income customers of water and power utilities who might experience higher rates as a result of costs of project-related system improvements.

These residents and workers may be most vulnerable to increases in CVP water and power costs and, conversely, would benefit from improved flood protection and CVP water and power supply reliability. Central Valley farm workers and other workers employed by businesses in the region that supply goods and services to agricultural operations also could benefit.

24.2 Regulatory Framework

24.2.1 Federal

Executive Order 12898

The purpose of Executive Order 12898 (part of which is excerpted in the introduction to this chapter) is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by Federal agencies.

In addition to the direction referenced above, Executive Order 12898 includes the following requirements:

- Each Federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin. *(Section 2-2)*

- Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public. *(Section 5-5(c))*

In addition, the presidential memorandum accompanying the executive order states that "(e)ach Federal agency shall analyze the environmental effects, including human health, economic and social effects, of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA of 1969."

Two documents provide some measure of guidance to agencies required to implement Executive Order 12898. The first is *Environmental Justice Guidance Under the National Environmental Policy Act* (December 1997), published by CEQ. The second document, the *Final Guidance for Incorporating Environmental Justice Concerns* (April 1998) published in the U.S. Environmental Protection Agency's NEPA Compliance Analysis, serves as a guide for incorporating environmental justice goals into preparation of the EIS under NEPA. These documents provide specific guidelines for assessing environmental justice effects associated with a proposed Federal project.

24.2.2 State

There are no State plans, policies, regulations, or laws related to environmental justice applicable to the project. However, Senate Bill 115 (Chapter 690, Statutes of 1999), signed into law in 1999, defined environmental justice in statute and established the Governor's Office of Planning and Research as the coordinating agency for State environmental justice programs (California Government Code, Section 65040.12). This law further required the California Environmental Protection Agency to develop a model environmental justice mission statement for boards, departments, and offices within the agency by January 1, 2001 (Public Resources Code, Sections 72000–72001). The purpose of this program is to inform decision-makers by providing guidance on environmental justice issues.

24.2.3 Regional and Local

There are no regional or local plans, policies, regulations, or laws related to environmental justice applicable to the project.

24.3 Environmental Consequences and Mitigation Measures

This section describes the potential environmental consequences of the project alternatives as they relate to environmental justice. This analysis relies on demographic data provided in the *Socioeconomics, Population, and Housing Technical Report* and incorporates that information as necessary to describe potential effects on minority and low-income communities.

24.3.1 Methods and Assumptions

According to CEQ and U.S. Environmental Protection Agency guidelines established to assist Federal and State agencies, a minority population is present in a project area if (1) the minority population of the affected area exceeds 50 percent, or (2) the minority-population percentage of the affected area is meaningfully greater than the minority-population percentage in the general population or other appropriate unit of geographic analysis. By the same rule, a low-income population exists if the project area consists of 50 percent or more people living below the poverty threshold, as defined by the U.S. Census Bureau, or is meaningfully greater than the poverty percentage of the general population or other appropriate unit of geographic analysis.

The CEQ guidance indicates that when agencies determine whether environmental effects are disproportionately high and adverse, they are to consider whether there is or would be an impact on the natural or physical environment (as defined by NEPA) that would adversely affect a minority population or low-income population.

None of the published guidelines define the term "disproportionately high and adverse," but CEQ includes a nonquantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population (CEQ 1997).

The following population characteristics are considered in this analysis:

- Race and ethnicity
- Per-capita income as it relates to the poverty level

The relevant demographic data were obtained from the U.S. Census Bureau and the California Department of Finance. Data are presented at the county level to accommodate the geographic size of each portion of the study area.

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50 percent or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50 percent, or is meaningfully greater than the general population (average statewide poverty level). Based on these criteria, Shasta and Tehama counties are not considered environmental justice communities. Within the lower Sacramento and Delta area, minority populations exceed 50 percent in Colusa, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties. Although the minority population in the lower Sacramento River and Delta area is projected to exceed 50 percent by 2020, the 63.8 percent representation would not be meaningfully greater than the statewide minority population, which is projected to be 62.5 percent. Within the CVP and SWP service areas, there are some low-income populations; however, these areas are so expansive that they are

considered synonymous with the entire state of California for environmental justice purposes.

Native American Outreach

Public and stakeholder coordination meetings were conducted on behalf of Reclamation with Native American tribal groups whose traditional territories overlap the primary study area. Seven tribal groups were invited to an information meeting held on April 4, 2007, in Redding, California. The purpose of the meeting was to provide general information about the project, initiate Section 106 consultation with groups desiring to participate in the project, and introduce Elena Nilsson as the Native American Tribal Coordination study lead. Invitations were sent to the Grindstone Rancheria, Paskenta Rancheria, Pit River Tribe, Redding Rancheria, Shasta Nation, Winnemem Wintu, and the Wintu Tribe and Toyon-Wintu Center. The meeting was attended by representatives from the Winnemem Wintu and the Madesi Band of the Pit River Tribe.

Between August 2007 and March 2008, nine meetings were held with Native American groups whose traditional territories overlap with the primary study area. These included meetings and/or workshops with groups and individuals representing major tribes and/or extended family groups in the Shasta/Redding area regarding potential effects on cultural resources from a plan to enlarge Shasta Dam. The purposes of the meetings were to solicit, clarify, and document major concerns and issues regarding the project, and to establish a preferred method/approach to maintaining effective communication during the remainder of the project study and in future endeavors. Five groups participated in these meetings: Grindstone Indian Rancheria (one meeting), Paskenta Band of Nomlaki Indians (one meeting), Pit River Tribe (three meetings), Shasta Nation (one meeting), and Winnemem Wintu (three meetings).

24.3.2 Criteria for Determining Disproportionately High and Adverse Effects

To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

24.3.3 Topics Eliminated from Further Consideration

No topics related to environmental justice that are included in the significance criteria listed above have been eliminated from further consideration. All relevant topics are analyzed below.

Effects on sites considered sacred by local Native American communities in the upper Sacramento River portion of the primary study area and the lower Sacramento River and Delta and CVP and SWP service areas have been eliminated from further discussion. No impacts on these resources are anticipated as a result of changes in Shasta Dam operations (i.e., storage and release scenarios). Furthermore, any construction activities near sites considered sacred by local Native American communities would require mitigation as stated in Chapter 14 "Cultural Resources," including compliance with Section 106 of the National Historic Preservation Act (NHPA). As a result, no disproportionately high and adverse effects on Native American populations would be expected; therefore, potential effects related to this topic in these geographic regions are not discussed further in this EIS.

24.3.4 Direct and Indirect Effects

No-Action Alternative

Shasta Lake and Vicinity

Impact EJ-1 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake Communities at Shasta Lake and in the vicinity would remain below minority and low-income thresholds as they relate to environmental justice. Adverse construction-related impacts would be avoided, and construction-related employment opportunities and gains within local economies would not be realized. Existing adverse effects on minority or low-income populations do not constitute a disproportionately high and adverse impact. No disproportionately high and adverse effects on minority or low-income populations would occur.

Shasta County would maintain its steady population growth under the No-Action Alternative. Between 1990 and 2010, the population increased by 25.3 percent, with total population projected to reach 196,087 by 2020 (DOF 2010, 2012). The minority (nonwhite) population, including the Winnemem Wintu Tribe and other Native Americans, is projected to account for 16.6 percent of the total population in Shasta County in 2020, slightly more than the current 14.3 percent representation, but less than the 62.5 percent minority population projected statewide for 2020.

As described in Table 24-1, the poverty level in Shasta County increased by 2.3 percent during 2000 to 2010, and unemployment rates in Shasta County were mostly steady during 2000 to 2010, fluctuating between 6.0 and 8.1 percent. However, the poverty and unemployment rates are expected to decrease as the economy recovers. Employment opportunities continue to be provided in the region by major employment sectors such as trade, transportation, and utilities; government; educational, and health services; and leisure and hospitality industries (see Chapter 16, "Socioeconomics, Population, and Housing"). Professional and business services and education and health services are

projected to be the leading growth industries in Shasta County; these are also the top two anticipated growth industries statewide. No disproportionately high or adverse impacts on minority or low-income communities are anticipated under the No-Action Alternative. Mitigation is not required for the No-Action Alternative.

Impact EJ-2 (No-Action): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake Shasta Dam would not be enlarged; no infrastructure would be removed, modified, or relocated; and no changes in Reclamation's Shasta Lake operations would occur. No disproportionately high and adverse effects on Native American populations would occur.

Under the No-Action Alternative, Shasta Dam would not be enlarged; no infrastructure would be removed, modified, or relocated; and no changes in Reclamation's Shasta Lake operations would occur. Therefore, there would be no effect on several locations in the vicinity of Shasta Lake that are considered sacred by local Native American communities. No disproportionately high and adverse effects on Native American populations would occur. Mitigation is not required for the No-Action Alternative.

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact EJ-3 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Communities in the upper Sacramento River portion of the primary study area would remain below minority and low-income thresholds for environmental justice. The No-Action Alternative would not cause long-term operational changes; therefore, communities adjacent to the Sacramento River would not be affected by long-term changes to environmental and recreational conditions. Construction-related gains within this area would not be realized. Existing adverse effects on minority or low-income populations would not be disproportionately high and adverse. No disproportionately high and adverse effects on minority or low-income populations would occur.

Tehama County would maintain its steady population growth under the No-Action Alternative. Between 1990 and 2010, the population increased by 27.2 percent, with total population projected to reach 68,769 by 2020 (DOF 2010). The minority (nonwhite) population is projected to account for 31 percent of the total population in Tehama County in 2020, an increase of nearly 7 percent from the current 23.9 percent level, but less than the 62.5 percent minority population projected statewide for 2020.

As described in Chapter 16, "Socioeconomics, Population, and Housing," during 2000 to 2010, the poverty level in Tehama County increased by 2.2 percent and unemployment rates in Tehama County fluctuated between 6.4 and 8.8 percent. Tehama County is similar to neighboring Shasta County in employment and income trends, and dominant employment sectors. Projected

growth industries differ between the two counties, however; Tehama County is projected to experience economic growth in construction and information services (see Chapter 16, "Socioeconomics, Population, and Housing"). These sectors are the third and fifth largest anticipated growth areas statewide.

Because the No-Action Alternative would not change existing or projected future conditions, it would not have a disproportionately high or adverse effect on minority or low-income communities. Mitigation is not required for the No-Action Alternative.

Lower Sacramento River and Delta

Impact EJ-4 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Some communities within the lower Sacramento River and Delta portion of the extended study area contain minority and low-income populations above environmental justice thresholds; however, continuing the existing and projected future conditions under the No-Action Alternative would not affect those populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

The lower Sacramento River and Delta portion of the extended study area includes Butte, Colusa, Contra Costa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties. In 2010, the population of the nine-county region was 4,226,027. This number is expected to grow by 47.5 percent to 6,294,088 by 2020 (DOF 2010, 2012). The minority (nonwhite) population is projected to account for 63.8 percent of the total population in the lower Sacramento River and Delta area by 2020, with minority populations exceeding 50 percent in Colusa, Sacramento, San Joaquin, Solano, Sutter, and Yolo counties. Although the minority population in the lower Sacramento River and Delta area is projected to exceed 50 percent by 2020, the 63.8 percent representation would not be meaningfully greater than the statewide minority population, which is projected to be 62.5 percent.

In 2010, poverty levels in the nine-county region ranged from 10 percent to 20 percent, with low-income populations exceeding the 15.5 percent statewide poverty level in Butte, Glenn, Sacramento, San Joaquin, and Yolo counties (U.S. Census Bureau 2009b). Employment and labor trends in the lower Sacramento River and Delta portion of the extended study area are generally consistent with statewide trends. In 2010, approximately 15.6 percent of the labor force in the nine-county area was classified as unemployed, compared to a statewide total of 7.7 percent. Butte, Colusa, Sacramento, San Joaquin, Solano, and Sutter counties registered higher unemployment rates than the state as a whole in 2010. Generally, the counties with the highest unemployment rates in 2010 were characterized by greater dependence on the agricultural industry and less industrial diversity. Five of the six counties with unemployment rates above the statewide average maintained more than 60 percent of their land mass in

agricultural production. Unemployment rates tend to be higher in rural areas than in urban areas because farm work is typically seasonal or temporary.

The lower Sacramento River and Delta portion of the extended study area has some low-income populations and some counties with a higher unemployment rate than the statewide average. However, the No-Action Alternative would not change the existing or projected future conditions. Therefore, the No-Action Alternative would not have disproportionately high and adverse effects on minority or low-income populations. Mitigation is not required for the No-Action Alternative.

CVP/SWP Service Areas

Impact EJ-5 (No-Action): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas

Some communities within the CVP and SWP service areas contain minority and low-income populations above environmental justice thresholds; however, adverse effects on CVP and SWP customers within these communities do not constitute a disproportionately high and adverse impact. Continuing the existing and projected future conditions under the No-Action Alternative would not affect these populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

The CVP and SWP service areas are so expansive that they may be considered synonymous with the entire state of California for environmental justice purposes. Together, the CVP and SWP service areas include 36 of California's 58 counties, accounting for 91 percent (39 million residents) of California's population in 2010. The state's population has increased by almost 30 percent since 1990 and is projected to increase by approximately 32 percent to more than 51 million people by 2020 (DOF 2010). Continued ethnic diversification is expected. Minority groups have been steadily increasing their proportion of the state population. The population of individuals in California identifying themselves as Asian–Pacific Islander or multiracial experienced double-digit population growth, while those identifying themselves as Black or African American experienced the least amount of growth between 2000 and 2010 (U.S. Census Bureau 2010b). Hispanics are the most numerous minority group in California, and many members of this ethnic group work on farms that receive some or all of their water from the CVP. In general, rural agricultural counties have smaller minority populations than urban counties.

Poverty levels for both individuals and children in California increased slightly between 2000 and 2010. The percentage of people below the poverty level in Shasta County is expected to follow national and statewide economic trends. Generally, poverty rates tend to be higher in rural counties than in urban counties. Despite these overall differences, each of the state's major urban areas has pockets of low-income neighborhoods with high poverty rates.

California's total labor force increased just over 2 percent from 2002 to 2005, adding between 100,000 and 200,000 individuals each year. Between 2004 and 2005, the labor force increased by approximately 188,000 individuals. This was the largest annual increase over the 4-year period. California's total labor force exceeded 18.8 million in 2010. The state's unemployment rate was lowest in 2000 (5.0 percent), and has been increasing since 2003. Unemployment in 2010 registered at 7.7 percent, greater than the state's 2001 unemployment rate of 5.4. This observed increase in the unemployment rate at the state level has coincided with similar national employment trends. Like poverty, unemployment rates tend to be lower in urban areas than in rural areas of the state; however, high unemployment rates are often found in low-income neighborhoods of major urban centers.

Although the CVP and SWP service areas have some low-income populations, the No-Action Alternative would not change the existing or projected future conditions. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation is not required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

Shasta Lake and Vicinity
Impact EJ-1 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake
Communities adjacent to the project construction site may experience temporary or short-term adverse environmental effects because of construction activities and changes in project conditions and operations. However, neither construction-related nor operational effects would disproportionately affect minority or low-income populations in the vicinity of Shasta Lake. Increased employment and income opportunities could also result from project construction activities, and would not be disproportionately distributed among minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

Under this alternative, the dam would be raised by 6.5 feet over a 4.5-year construction period. Residents near Shasta Dam, as well as others who may commute or otherwise travel near construction sites, would be exposed to a range of potentially adverse environmental and public health effects over a 4.5-year construction period (see Engineering Summary Appendix). Temporary and/or short-term adverse noise, visual, and air quality effects could result; in addition, motorists could be delayed, and access to recreation opportunities or local businesses could be temporarily reduced. Negative health effects could also result if hazardous materials were to be accidentally released into the environment during construction.

Nonwhite individuals, including the Winnemem Wintu Tribe and other Native Americans, accounted for 16.6 percent of Shasta County's total population in 2010, well below the 50 percent threshold for a minority population. This percentage is also substantially less than the 2010 statewide nonwhite population of 42.4 percent. Likewise, the poverty rate in Shasta County was 17.7 percent in 2010, well below the 50 percent threshold and slightly greater than the 15.5 percent statewide poverty rate. Therefore, the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, minority and low-income populations would not be disproportionately affected by these adverse effects.

Increased employment and income opportunities may result from construction under CP1, which could benefit minority and low-income populations. Project construction under CP1 could increase the number of jobs available, or could improve business conditions and incomes for workers who are already employed by businesses that would directly or indirectly benefit from project-related construction spending. The project would require a labor force of 300 people drawn directly from the Shasta Lake area. Most (85 percent) of the construction materials and supplies would be purchased in the vicinity; these materials and supplies would constitute 60 percent of total construction costs. As described above, the percentages of minority and low-income individuals in Shasta County populations are well below threshold levels for minority and low-income populations, and employment effects would not be disproportionately distributed among these groups. Selected minority and low-income individuals may be potentially affected. Such economic and job-related impacts would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP1): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP1 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

Two tribes, the Winnemem Wintu and the Pit River Madesi Band, live within the vicinity of Shasta Lake, where they continue to actively practice many aspects of their traditional culture. Both groups have related that a complex

cultural landscape of village sites, ceremonial areas, sacred sites, burial sites, and resource areas would be affected directly by CP1.

Two particularly important Winnemem Wintu locations that would be affected by CP1 are Puberty Rock and the doctoring pools near Nawtawaket Creek. CP1 could submerge Puberty Rock for longer periods, restricting the Winnemen Wintu from holding the puberty ceremony at this important location. Relocating the rock to higher ground is not possible; in the Winnemem Wintu's worldview, its location is preordained and connected with the nearby "two sisters" mountain (Bolliboka Mountain). Puberty Rock also marks the location of an extensive village with housepits and burials, situated at Kabyai Creek, west of the McCloud River near the McCloud Campground. CP1 would inundate additional burials at this location, which would require removal and relocation. The Winnemem Wintu have estimated that 120 ancestral villages are still accessible above the current high-water line of Shasta Lake and would be adversely affected by CP1.

Pit River Madesi Band members state that 22 ethnographic villages, associated burial grounds, and several TCPs are located within the existing reservoir and proposed inundation or fluctuation areas.

Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to several locations in the vicinity of Shasta Lake; therefore, the disturbance and loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP1, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact EJ-3 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area
Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP1 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

In Tehama County, nonwhite individuals accounted for 18.0 percent of the total population in 2010. This is roughly half of the 50 percent threshold for a

minority population. This level also is substantially less than the statewide nonwhite population of 42.4 percent. The poverty level in Tehama County was 19.5 percent in 2010, also well below the 50 percent threshold and slightly higher than the 15.5 percent statewide poverty rate. From 2000 to 2010, poverty levels in Tehama County increase at a rate of 2.2 percent, outpacing the statewide poverty rate (1.3 percent) by 0.9 percent over approximately the same time. Based on this trend, and the comparatively consistent poverty rates between Tehama County and the statewide population, poverty levels in Tehama County are not meaningfully greater than poverty levels statewide. Therefore, the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Thus, disproportionately high and adverse effects on minority or low-income populations would not occur.

Communities along the upper Sacramento River portion of the primary study area would not be exposed to direct construction-related impacts associated with CP1.

Raising Shasta Dam would add 256,000 acre-feet of cold-water storage to the overall capacity of the reservoir. This operational change would be beneficial for two reasons. CP1 would reduce the risk of flooding downstream from Shasta Dam and consequently reduce potentially adverse social, economic, and environmental effects because of flooding for property owners, businesses, and workers. In addition, CP1 would improve environmental and recreational conditions by enhancing habitat for fish and wildlife, benefiting anglers, hunters, and wildlife viewers.

These beneficial impacts would not be disproportionately distributed among minority and low-income populations, because representation of these groups in the population of Tehama County is well below threshold levels. Selected minority and low-income individuals may be potentially affected; however, these environmental and recreational effects would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP1 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-2 (CP1). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high or adverse effects on minority or low-income populations would occur.

Operational effects of CP1 on minority and low-income populations in the lower Sacramento River and Delta portion of the extended study area would be similar to those described for the upper Sacramento River portion of the primary

study area under Impact EJ-2 (CP1). However, benefits in the lower Sacramento River and Delta area resulting from the reduced risk of flooding and improved environmental and recreational conditions would be less than described for the upper Sacramento River area because the lower Sacramento River and Delta is located at a greater distance from the project site. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP1): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply and power for businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high and adverse effects on minority or low-income populations would occur.

Utility customers in communities within the CVP and SWP service areas may experience indirect, adverse effects through rate increases as a result of CP1. Project-related water storage and hydroelectric facility improvements may be funded partly through increased rates for water and power services. However, such adverse effects would not disproportionately affect minority or low-income populations.

Operational changes resulting from CP1 may increase employment opportunities and water and power reliability in the CVP and SWP communities, which would be beneficial for individual utility customers and businesses. Selected minority and low-income individuals may be beneficially affected by increased employment opportunities. Such beneficial employment-related impacts would not disproportionately affect minority and low-income populations. Thus, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

Shasta Lake and Vicinity

Impact EJ-1 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake
Communities adjacent to the project construction site may experience temporary and/or short-term adverse environmental effects because of construction activities and changes in project conditions and operations.

However, neither construction-related nor operational effects would disproportionately affect minority or low-income populations in the vicinity of Shasta Lake. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur.

Effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 12.5 feet and the construction period likely would extend for up to 6 additional months. The beneficial effects and less-than-significant adverse impacts would be similar to those described under Impact EJ-1 (CP1) because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, disproportionately high and adverse effects on minority or low-income populations would not occur. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP2): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP2 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be similar to but slightly greater than Impact EJ-2 (CP1) because the inundation area under CP2 would be slightly greater than under CP1. A disproportionately high and adverse effect on Native American populations would occur. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP2, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term,

operational changes resulting from CP2 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-3 (CP1). CP2 would provide 187,000 acre-feet more cold-water storage capacity than CP1. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Thus, disproportionately high and adverse effects on minority or low-income populations would not occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP2 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-4 (CP2). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-4 (CP1). Under CP2, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 187,000 acre-feet of reservoir storage would provide somewhat greater benefits under CP2 than under CP1. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP2): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of

operational changes that improve the reliability of the water supply and power for businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-5 (CP1). Construction costs under CP2 would be greater than under CP1, because of the increased need for construction materials and an additional 6 months of construction. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those of CP1, and minority or low-income populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CP3 – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival

Shasta Lake and Vicinity

Impact EJ-1 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake

Communities adjacent to the project construction site may experience temporary and/or short-term adverse environmental effects because of construction activities and changes in project conditions and operations. However, neither construction-related nor operational effects would disproportionately affect minority or low-income populations in the vicinity of Shasta Lake. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-1 (CP1). Under CP3, the effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 18.5 feet and the construction period would extend for at least 6 additional months and require an additional 50 construction workers. The beneficial impacts and less-than-significant adverse impacts would be similar to those described under CP1 because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, disproportionately high effects on minority or low-income populations would not occur (nor would disproportionately high and beneficial effects). Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP3): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in

the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP3 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be similar to but slightly greater than Impact EJ-2 (CP2) because the inundation area under CP3 would be slightly greater than under CP2. A disproportionately high and adverse effect on Native American populations would occur. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP3, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)

Impact EJ-3 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low- Income Populations in the Upper Sacramento River Area

Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP3 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These beneficial operational effects would not be disproportionately distributed among minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-3 (CP1). CP3 would provide 378,000 acre-feet more cold-water storage capacity than CP1. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Thus, disproportionately high and adverse effects on minority or low-income populations would not occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and

Delta Area Operational effects of CP3 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-3 (CP3). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-4 (CP1). Under CP3, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 378,000 acre-feet of reservoir storage would provide somewhat greater benefits under CP3 than under CP1. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP3): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply reliability and power for businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-5 (CP1). Construction costs under CP3 would be greater than under CP1 because of the increased need for construction materials and an additional 6 months of construction. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those of CP1, and minority and low-income populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

Shasta Lake and Vicinity

Impact EJ-1 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake Communities adjacent to the project construction site may experience temporary and/or short-term adverse environmental effects because of construction activities and changes in project conditions and operations. However, neither construction-related nor operational effects would be disproportionately distributed among minority or low-income populations in the vicinity of Shasta Lake. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-1 (CP1). Under CP4 or CP4A, the effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 18.5 feet and the construction period would extend for at least 6 additional months and require an additional 50 construction workers. The beneficial effects and less-than-significant adverse impacts would be similar to those described under CP1 because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Adverse and beneficial effects would not be disproportionately distributed among minority or low-income populations.

Because adverse and beneficial effects would not be disproportionately distributed among minority or low-income populations, this impact is less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

Because adverse and beneficial effects would not be disproportionately distributed among minority or low-income populations, this impact is less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP4 and CP4A would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because the Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance

to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be similar to Impact EJ-2 (CP3), but the frequency and timing of inundation may vary between CP4 or CP4A and CP3. Additionally, the timing of inundation is different between CP4 and CP4A in that they each dedicate a portion of the new storage in Shasta Lake for fisheries purposes; however, the portion of this dedicated storage varies. The operations proposed for CP4A may result in the sacred sites being inundated less frequently inundated than for CP4 or CP3.

Although the sacred sites may be inundated less frequently under CP4A, both CP4 and CP4A are expected to have a disproportionately high and adverse effects on Native American populations. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP4 or CP4A, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact EJ-3 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP4 or CP4A could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These beneficial operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

The impact would be similar to Impact EJ-3 (CP1) for CP4 or CP4A. CP4 or CP4A would provide 634,000 acre-feet of additional water storage capacity. Like CP1, CP4 would provide 256,000 acre-feet of active storage in the reservoir. Similar to CP2, CP4A would create 443,000 acre-feet of new active storage capacity. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Minority and low-income populations would not be disproportionately affected.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact would be less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact would be less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP4 or CP4A would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-3 (CP4 and CP4A). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high and adverse effects on minority or low-income populations would occur for CP4 or CP4A.

This impact would be similar to Impact EJ-4 (CP1). Under CP4 or CP4A, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 378,000 acre-feet of dedicated storage for cold water pool for CP4, or the additional 191,000 acre-feet of dedicated storage for cold water pool for CP4A would provide somewhat greater benefits under CP4 or CP4A than under CP1. Minority and low-income populations would not be disproportionately affected.

No disproportionately high or adverse effects on minority or low-income populations would occur. Therefore, this impact is less than significant for CP4. Mitigation for this impact is not needed, and thus not proposed.

No disproportionately high or adverse effects on minority or low-income populations would occur. Therefore, this impact is less than significant for CP4A. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP4 and CP4A): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply and power

to businesses and others. Minority and low-income populations would not be disproportionately affected. No disproportionately high and adverse effects on minority or low-income populations would occur for CP4 or CP4A.

The impact for CP4 or CP4A would be similar to Impact EJ-5 (CP1) . Construction costs under CP4 or CP4A would be greater than under CP1 because of the increased need for construction materials and an additional 6 months of construction and require an additional 50 construction workers. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those under CP1 for CP4, and to those under CP2 for CP4A, and minority and low-income populations would not be disproportionately affected.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact for CP4 is less than significant. Mitigation for this impact is not needed, and thus not proposed.

No disproportionately high and adverse effects on minority or low-income populations would occur. Therefore, this impact for CP4A is less than significant. Mitigation for this impact is not needed, and thus not proposed.

CP5 – 18.5-Foot Dam Raise, Combination Plan

Shasta Lake and Vicinity

Impact EJ-1 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake

Communities adjacent to the project construction site may experience temporary adverse environmental effects because of construction activities and changes in project conditions and operations. However, the construction activity in any specific area would be short-term, and neither construction-related nor operational effects would constitute a high and adverse impact on minority or low-income populations in the vicinity of Shasta Lake. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-1 (CP1). Under CP5, the effects on minority and low-income populations would be similar to those described above for Impact EJ-1 (CP1), except that the dam would be raised by 18.5 feet and the construction period would extend for at least 6 additional months and require an additional 60 construction workers. The beneficial effects and less-than-significant adverse impacts would be similar to those described under CP1 because the types of work and the predicted workforce would be similar under each alternative. As described under Impact EJ-1 (CP1), the percentages of minority and low-income individuals in populations in Shasta County are well below threshold levels for a minority or low-income population. Therefore, minority and low-income populations would not be disproportionately affected.

No disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

Impact EJ-2 (CP5): Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake The local Native American community has identified several locations in the vicinity of Shasta Lake that they consider to be sacred. Notable among these locations are the Winnemem Wintu's Puberty Rock and the doctoring pools near Nawtawaket Creek and the Pit River Madesi Band's ethnographic villages, associated burial grounds, and several TCPs. CP5 would have a substantial adverse effect on several of these locations in the vicinity of Shasta Lake. Because Winnemem Wintu and Pit River Madesi Band members attach religious and cultural significance to these locations, the disturbance or loss of resources associated with these locations would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

This impact would be the same as Impact EJ-2 (CP3). Disproportionately high and adverse effects on Native American populations would occur. Mitigation for this impact is not proposed because no feasible mitigation (or action alternative) is available to avoid or minimize the high and adverse effect. However, Reclamation is committed to and will comply with the Federal NHPA Section 106 consultation process to avoid, minimize, or mitigate any significant, adverse impacts to cultural resources and historic properties due to CP5, to the extent possible. Additional information on cultural resources mitigation is located in Chapter 14, "Cultural Resources."

Upper Sacramento River (Shasta Dam to Red Bluff)
Impact EJ-3 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area
Effects from project-related construction are not anticipated in the upper Sacramento River area downstream from Shasta Dam. In the long term, operational changes resulting from CP5 could reduce the risk of flooding and enhance environmental and recreational conditions in this area. These operational effects would not constitute a disproportionately high and adverse impact on minority and low-income populations. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-3 (CP1). CP5 would provide 378,000 acre-feet more cold-water storage capacity than CP1. Greater storage capacity would reduce the risk of flooding and, along with increased cold water, would benefit downstream fisheries and recreation resources and users. Also, as described under Impact EJ-3 (CP1), the percentages of minority and low-income individuals in populations in Tehama County are well below threshold levels for minority and low-income populations. Therefore, minority and low-income populations would not be disproportionately affected. No

disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

Lower Sacramento River and Delta

Impact EJ-4 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area Operational effects of CP5 would be similar to those described for the upper Sacramento River portion of the primary study area under Impact EJ-3 (CP5). However, because the beneficial effects (reduction of flooding risk and improved environmental and recreational conditions) would diminish with distance from the project site, the benefits in this area would be less. No disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-4 (CP1). Under CP5, reduced flooding and beneficial effects on fisheries and recreation resources also would occur in the lower Sacramento River and Delta portion of the extended study area. However, the beneficial effects would be less than along the upper Sacramento River because benefits would diminish with increasing distance from the project site. As in the upper Sacramento River portion of the primary study area, the additional 378,000 acre-feet of reservoir storage would provide somewhat greater benefits under CP5 than under CP1. Minority and low-income populations would not be disproportionately affected. No disproportionately high or adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

CVP/SWP Service Areas

Impact EJ-5 (CP5): Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas Direct construction-related impacts are not anticipated in the CVP and SWP service areas. The project could result in adverse indirect impacts because of water and power rate increases for customers within the CVP and SWP service areas. Employment opportunities and personal incomes may increase because of operational changes that improve the reliability of the water supply and power for businesses and others. Minority and low-income populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur.

This impact would be similar to Impact EJ-5 (CP1). Construction costs under CP5 would be greater than under CP1 because of increased materials, an additional 6 months of construction, and 60 additional construction workers. These increased costs would result in slightly greater increases in water and power rates than under CP1. However, such adverse effects would not disproportionately affect minority and low-income populations. Operational benefits would be similar to those under CP1, and minority and low-income

populations would not be disproportionately affected. Therefore, no disproportionately high and adverse effects on minority or low-income populations would occur. Mitigation for this impact is not needed, and thus not proposed.

24.3.5 Mitigation Measures

Table 24-2 presents a summary of effects and mitigation measures for environmental justice.

No-Action Alternative

No mitigation measures are needed for this alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation measures are needed for Impacts EJ-1 (CP1), EJ-3 (CP1), EJ-4 (CP1), or EJ-5 (CP1). No feasible mitigation is available for Impact EJ-2 (CP1). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

Table 24-2. Summary of Mitigation Measures for Environmental Justice

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact EJ-1: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
Impact EJ- Impact EJ-2: Potential Disproportionate High and Adverse Effect on Native American Populations in the Vicinity of Shasta Lake	Effect before Mitigation	NDHA	DHA	DHA	DHA	DHA	DHA
	Mitigation Measure	None required.	No feasible mitigation is available to reduce impact.				
	Effect after Mitigation	NDHA	DHA	DHA	DHA	DHA	DHA
Impact EJ- Impact EJ-3: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
Impact EJ- Impact EJ-4: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
Impact EJ- Impact EJ-5: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas	Effect before Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA
	Mitigation Measure	None required.	None needed; thus, none proposed.				
	Effect after Mitigation	NDHA	NDHA	NDHA	NDHA	NDHA	NDHA

Key:
CP = Comprehensive Plan
CVP = Central Valley Project
DHA = Disproportionately high and adverse
NDHA = Not disproportionately high and adverse
SWP = State Water Project

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

No mitigation measures are needed for Impacts EJ-1 (CP2), EJ-3 (CP2), EJ-4 (CP2), or EJ-5 (CP2). No feasible mitigation is available for Impact EJ-2 (CP2). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply

No mitigation measures are needed for Impacts EJ-1 (CP3), EJ-3 (CP3), EJ-4 (CP3), or EJ-5 (CP3). No feasible mitigation is available for Impact EJ-2 (CP3). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

CP4 and CP4A – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

No mitigation measures are needed for Impacts EJ-1 (CP4 and CP4A), EJ-3 (CP4 and CP4A), EJ-4 (CP4 and CP4A), or EJ-5 (CP4 and CP4A). No feasible mitigation is available for Impact EJ-2 (CP4 and CP4A). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

CP5 – 18.5-Foot Dam Raise, Combination Plan

No mitigation measures are needed for Impacts EJ-1 (CP5), EJ-3 (CP5), EJ-4 (CP5), or EJ-5 (CP5). No feasible mitigation is available for Impact EJ-2 (CP5). The disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in an unmitigable disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake.

24.3.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table

3-1 under Quantitative Analysis would have disproportional effects on minority or low income populations in the primary study area and the SLWRI would not have adverse impacts in the extended study area, therefore, the following analysis is based on programs and projects listed in Table 3-1 under Qualitative Analysis that would have potential effects in the primary study area as explained below.

In the primary study area (i.e., Shasta Lake and vicinity and the upper Sacramento River from Shasta Dam to Red Bluff), minority and low-income populations are not disproportionately represented. Identified construction effects would be less than significant, and minority and low-income populations would not be disproportionately affected.

Some communities within the extended study area (i.e., the lower Sacramento River and Delta and the CVP and SWP service areas) exceed minority and low-income thresholds. These communities, along with the general population, would benefit from project effects that would reduce future water shortages by improving water supply reliability for both average and drought years. The greatest benefit would be provided by CP3, CP4, CP4A, and CP5, which would provide an additional 634,000 acre-feet of storage capacity. CP1 and CP2 would provide only 256,000 and 443,000 acre-feet of increased storage capacity, respectively, with correspondingly reduced benefits.

Alternatives that would incorporate the greatest increase to dam height would result in the greatest project cost because of higher costs for construction materials and longer construction periods. These increased costs may be reflected in increased utility rates that could be combined with other utility rate increases. Such rate increases would be incremental and would be experienced by the general population, along with minority and low-income communities.

Therefore, the project would not contribute to disproportionate placement of environmental impacts on low-income and minority populations or communities, and no cumulatively considerable impacts would result.

The disturbance or loss of resources associated with locations considered by Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance would result in a disproportionately high and adverse effect on Native American populations in the vicinity of Shasta Lake. Past and present effects to sites of religious and cultural significance are from construction projects, such as Shasta Dam, recreation development and use, and forest management practices. Reasonably foreseeable future projects on Table 3-1 that may affect these resources include but are not limited to Antlers Bridge Replacement Project, which proposes to avoid construction impacts to cultural resources. However due to past and present impacts on these sites, when considered with the effects of the SLWRI, the project would contribute to disproportionate placement of environmental impacts on Native American

populations and would result in a cumulatively considerable incremental contribution to a significant and unavoidable cumulative impact.

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Chapter 25
Wild and Scenic River Considerations for McCloud River

This chapter describes the effects of the dam and reservoir modifications proposed under SLWRI action alternatives on the wild and scenic river values of the lower McCloud River, one of the major tributaries to Shasta Lake.

This chapter differs from the other chapters in this EIS in that it concerns only the McCloud River and does not discuss other portions of the primary study area nor the extended study area. The study area for this chapter consists of the lower McCloud River from the McCloud River Bridge to the confluence with Little Bollibokka Creek (Figure 25-1).

The primary focus of this chapter is the wild and scenic river values of the lower McCloud River, particularly the reach that would periodically be newly inundated if Shasta Dam and Shasta Lake were enlarged. The discussion and analysis concentrate on the values for which the McCloud River has been determined eligible for listing under the Federal Wild and Scenic Rivers Act ((Federal WSRA); Public Law 90-542, as amended; 16 U.S. Code 1271-1287) and for which a portion of the river is protected under the California Public Resources Code (PRC) Section 5093.542. Section 5093.542 was established through enactment of the California Wild and Scenic Rivers Act, as amended (Sections 5093.50 – 5093.70).

This chapter also differs from the other chapters in this EIS; it first provides background information and then discusses the regulatory framework to provide context for the affected environment section.

25.1 Background

Segments of the McCloud River have been determined eligible for listing under the Federal WSRA and are protected under the PRC. The river has not been formally listed as wild and scenic under either the Federal WSRA or PRC and is not part of either the national or State river system.

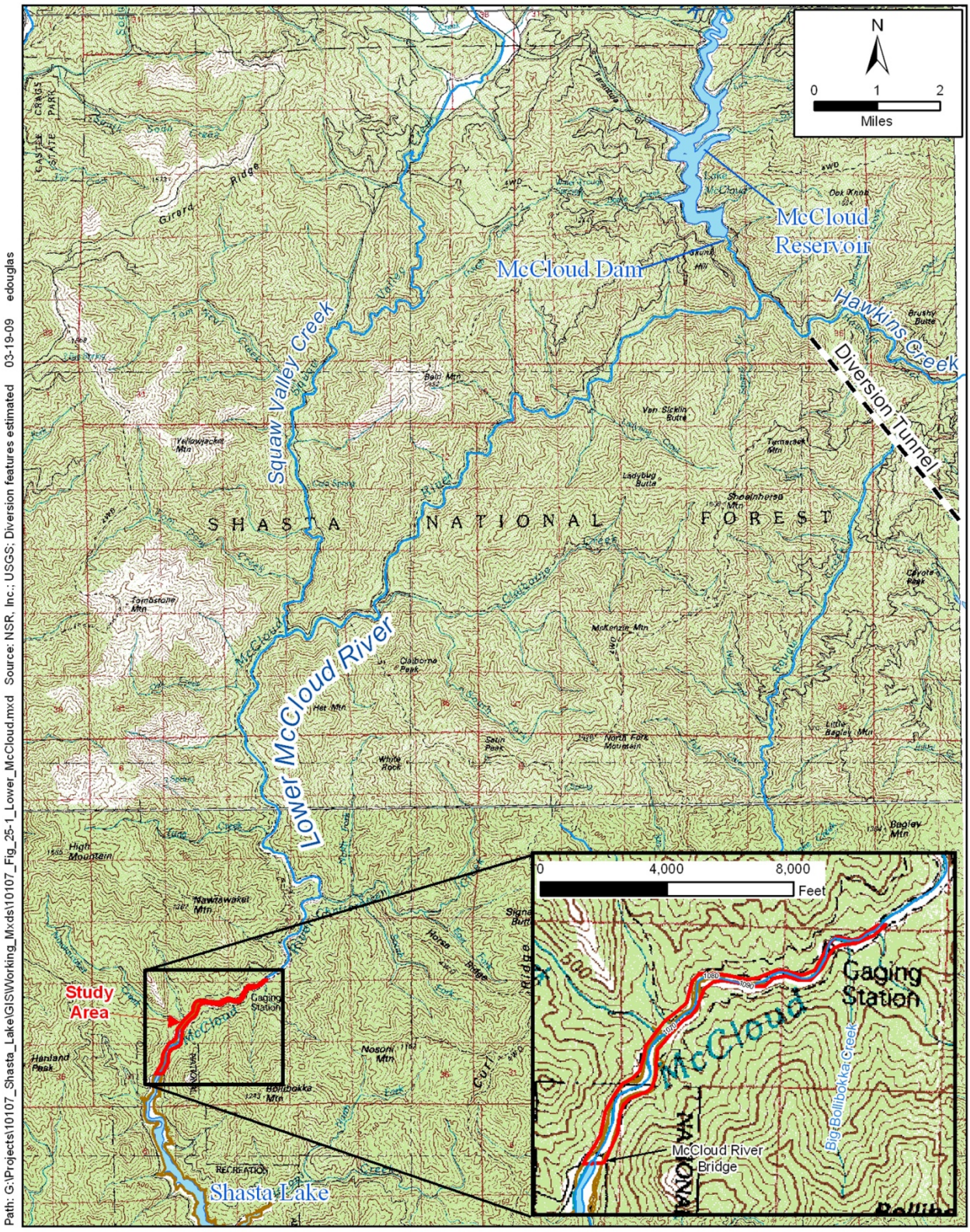

Figure 25-1. Lower McCloud River Study Area

The USFS evaluated the eligibility of the McCloud River for listing as wild and scenic under the Federal WSRA during preparation of the Shasta-Trinity National Forest (STNF) Land and Resource Management Plan (LRMP) in 1994 (USFS 1994). Although the LRMP found the McCloud River eligible for listing, the LRMP direction was to not formally designate any reach of the river as wild and scenic. Instead, the direction was to manage the lower McCloud River under a Coordinated Resource Management Plan (CRMP; USFS 1995a). The CRMP is a coordinated effort between landowners and stakeholders with a vested interest in the river. The CRMP requires its signatories to protect the outstandingly remarkable values (ORV) on lands they own or manage to ensure that the river remains eligible for Federal designation as wild and scenic. The CRMP contains a provision stating that the USFS reserves the right to pursue designation if the CRMP is terminated or fails to protect these values.

The California Natural Resources Agency (Resources Agency) evaluated the McCloud River in the late 1980s (Jones & Stokes Associates 1988) to determine whether it was eligible for listing under the PRC. The Resources Agency study found it eligible, but the California legislature declined to add the river to the California wild and scenic river system. The legislature instead passed an amendment to the California Wild and Scenic Rivers Act to protect the river's free-flowing condition and the river's fishery below McCloud Dam through the PRC.

As described in more detail under "Regulatory Framework," the PRC and Federal WSRA share several similar components: the establishment of a wild and scenic rivers system; the purpose of protecting certain rivers in their "free-flowing" condition; the identification of extraordinary or outstandingly remarkable values that make such rivers eligible for protection; a study process and procedure for including rivers in the system; and classifications of "wild," "scenic," and "recreational." Both the Federal WSRA and PRC prohibit new water impoundments on designated rivers, and both contain directives to government agencies to use their powers to further the policies of the legislation.

The Federal WSRA establishes a larger wild and scenic river corridor—typically at least 0.25 mile on each side of the river—than the PRC and requires Federal agencies to manage the public lands in the corridor to protect the river's free-flowing character and ORVs. In addition, the Federal agency managing rivers that are Federally designated as wild and scenic is required to develop and implement a management plan that will ensure the river's protection. In contrast, the PRC provides protection only to the first line of permanent riparian vegetation and does not require a management plan.

The length of the lower McCloud River that was determined to be eligible for wild and scenic river status differs between the Federal and State evaluations. The USFS defined the lower McCloud River more narrowly than the Resources Agency, considering the portion of the river that is currently periodically

inundated by Shasta Lake – referred to in this chapter as the *transition reach* – as part of the lake rather than part of the river. The USFS defined the lower river as extending from McCloud Dam downstream to an elevation of 1,070 feet mean sea level (msl) (approximately 22 total river miles), which corresponds to the current full-pool elevation of Shasta Lake. The Resources Agency's study report included approximately 5,400 feet of the existing transition reach (down to the McCloud River Bridge) as part of the lower river's segments (approximately 23 total river miles). Both the USFS and Resource Agency documents disclosed that this portion of the reach, protected under the State PRC, does not meet the definition of natural or free flowing because it is downstream of McCloud Dam and some portions of the river offer public access. It is important to note that CDFW designated the Wild Trout Management Area downstream to the boundary of The Nature Conservancy property; the management area did not extend downstream in the reaches primarily controlled by private fishing clubs. The public benefit component of the wild trout fishery is concentrated in the upper 7 miles of the lower McCloud River.

In its evaluation, the USFS divided the McCloud River into 10 segments encompassing 46 total river miles: three segments along the upper McCloud River (24 river miles above McCloud Reservoir) and seven segments along the lower McCloud River (22 river miles below McCloud Dam). Numbering of the upper McCloud River segments began at the headwaters and counted downstream, but numbering of the lower McCloud River segments began at the downstream extent and counted upstream. The USFS concluded that all 10 segments of the McCloud River were eligible for listing as a Federal wild and scenic river because they are free flowing, possess good water quality, and exhibit ORVs in the areas of cultural and historical resources, fisheries, geology, and scenic resources. Part of the lowermost segment – Segment 4 – would be periodically inundated if Shasta Lake is expanded. Segment 4 extends from about 5,400 feet upstream from the McCloud River Bridge, beginning at an elevation of 1,070 feet msl, to about Little Bollibokka Creek. The lower extent of this segment corresponds with the current full-pool elevation of Shasta Lake based on Reclamation geographic information system data. Figure 25-2 shows the downstream extent of Segment 4.

The Resources Agency's report also identified 10 segments, but its evaluation encompassed only 43 total river miles and the numbering of segments began at the headwaters and counted downstream along the entire river. The segments included six along the upper river (20 river miles above McCloud Reservoir) and four along the lower river (23 river miles below McCloud Dam). Eight of the 10 segments were determined eligible for State wild and scenic river status. Segment 10 extends from the McCloud River Bridge to the northern border of Section 9, Township 36 North, Range 3 West, which is just upstream from the river's confluence with Tuna Creek. Approximately 5,400 feet of the transition reach is included in Segment 10; the portion of the transition reach downstream

from the bridge was determined ineligible. The downstream extent of Segment 10 is shown on Figure 25-2.

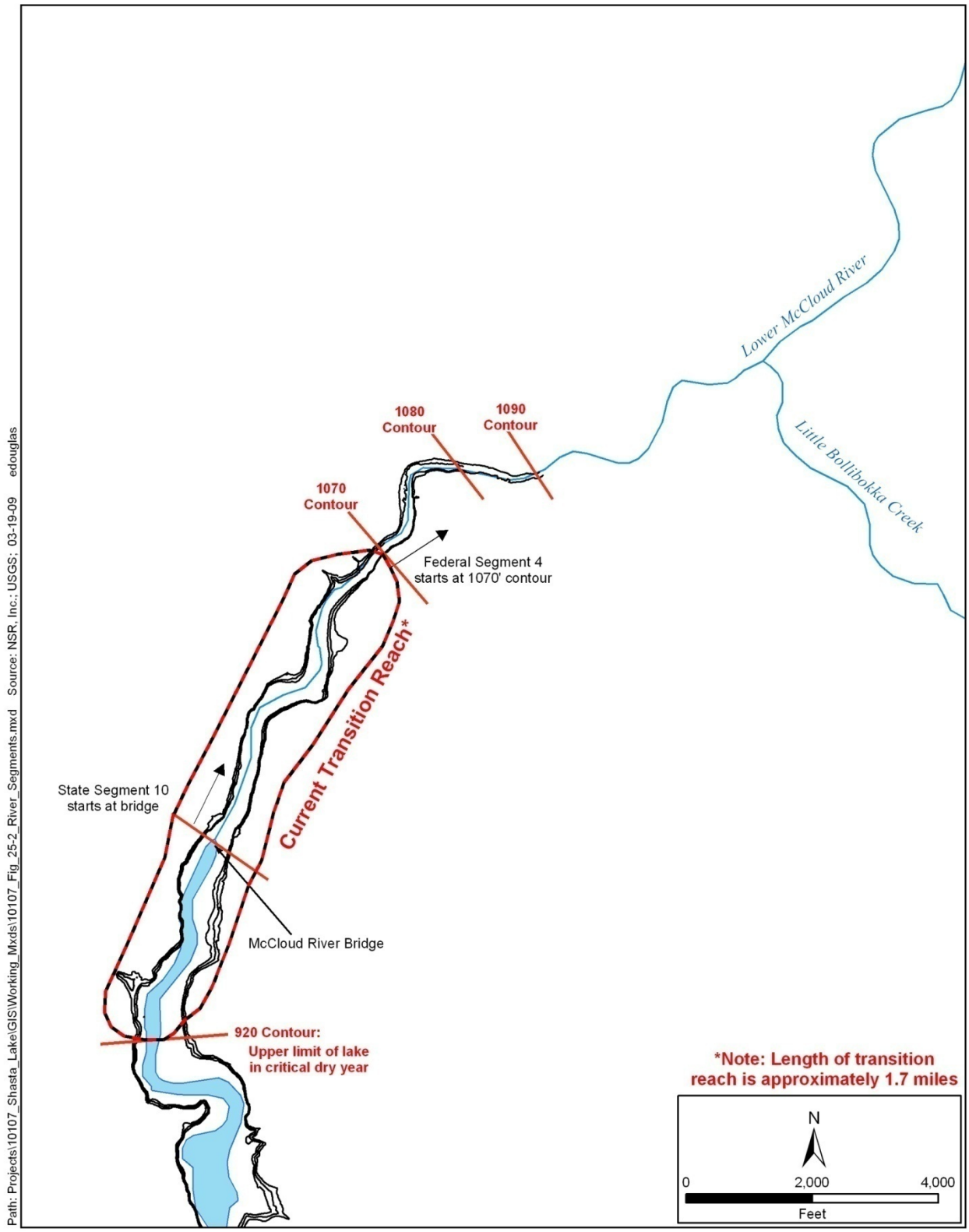

Figure 25-2. Differences in State and Federal Segments and Transition Reach

25.2 Regulatory Framework

25.2.1 Federal

Federal Wild and Scenic Rivers Act

The Federal WSRA, enacted in 1968, established the National Wild and Scenic Rivers System "to preserve rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations." To be eligible for inclusion in the system, a river must be free-flowing and exhibit ORVs. Free-flowing means "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway" (16 United States Code (USC) Section 1286). ORVs are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (16 USC Section 1271). Depending on the specific conditions of a river, it may be designated as "wild," "scenic," or "recreation." Different segments of a single river can receive different designations; in other words, some segments can be designated wild, some scenic, and some recreation or combinations of these designations.

The Federal WSRA does not prohibit water developments that may affect portions of rivers that are eligible for inclusion in the National Wild and Scenic Rivers System. Section 5(d)(1) of the act does, however, require that in all planning for the use and development of water and related land resources, consideration be given to potential national wild, scenic, and recreational river areas by all Federal agencies involved.

Through the development and approval of the STNF LRMP, the USFS determined that segments of the McCloud River are eligible for inclusion in the national system; however, the river has not been formally designated and thus is not afforded protections under the Federal WSRA. Instead, the McCloud River CRMP was developed "to protect the [river's] unique and outstandingly remarkable features," thereby maintaining its eligibility.

The USFS evaluation concluded that the lower McCloud River, from McCloud Dam downstream about 22 miles to the river's transition to Shasta Lake at about 1,070 feet msl, provides outstanding cultural, fisheries, and geologic values, and its corridor has been classified as a highly sensitive visual area by the USFS (USFS 1994 and 1995b). The entire river corridor contains prehistoric and historic sites from past use by Indian tribes, late 1800 and early 1900 resorts, and evidence of historic logging. The lower river provides habitat for several salmonid species: bull trout/Dolly Varden (*Salvelinus confluentus*), which is believed to be extinct; rainbow trout (*O. mykiss*), which has been transplanted all over the world; and brown trout (*Salmo trutta*), a non-native species. Collectively, the rainbow and brown trout in the lower McCloud River are considered to be a "blue ribbon trout fishery" (USFS 1994). Outstanding geologic values include rock outcrops, cascades, and pools. Based on the ORVs,

the STNF determined that the lower McCloud River meets the eligibility requirements for designation under the Federal WSRA.

Shasta-Trinity National Forest Land and Resources Management Plan

The STNF LRMP is a forest-wide land use plan developed to guide resource management within the forest (USFS 1995b). For planning purposes, the STNF is divided into six land allocations for which specific management prescriptions are identified. The land allocations include Congressionally Reserved Areas, Late-Successional Reserves, Administratively Withdrawn Areas, Riparian Reserves and Key Watersheds, Matrix Lands, and Adaptive Management Areas. Management areas were identified within the STNF to establish management direction in response to the issues and resources of each distinct area. The Management Area defined for the McCloud River provides resource direction for recreational use, specifically fishing (i.e., fishery) and viewing waterfalls, and management of old-growth habitat. Management of the wild and scenic river ORVs of the McCloud River is deferred to the CRMP.

Coordinated Resource Management Plan

In 1990, certain public agencies and private parties with interests in the management of lands adjacent to the McCloud River executed a memorandum of understanding to pursue preparation of a CRMP. The memorandum was signed by representatives of the USFS, CDFW, The Nature Conservancy, Pacific Gas and Electric Company (PG&E), the Bollibokka Land Company, Crane Mills, McCloud River Co-Tenants, Sierra Pacific Industries, and the Hearst Corporation. In 1991, the same signatories, along with California Trout Inc., signed another memorandum of understanding to establish the framework for and approve the CRMP. The CRMP was adopted in July 1991. In 2007, the property owned by the Bollibokka Land Company was sold to Westlands Water District, which is not a party to the CRMP. Although Reclamation and representatives of Westlands Water District have attended periodic meetings with the CRMP members to provide updates on the SLWRI planning process, neither agency is a party to the CRMP.

The purpose of the CRMP is to protect the ORVs through coordinating the actions of signatory members on their individual properties. The CRMP has no authority, responsibility, or jurisdiction for protection of the ORVs beyond the actions of the signatory members on their properties. The CRMP provides a framework for coordinating management activities among the participants to ensure that the characteristics of the river that make it eligible for Federal wild and scenic river designation are protected.

Under the terms of the CRMP, the USFS “reserves the right to pursue [Federal wild and scenic river] designation” if the CRMP is terminated or significantly impaired or if it fails to protect the values that make the river suitable for such designation. This would occur if, for any reason, the actions of a signatory member of the CRMP on the signatory member’s land failed to protect the ORVs, as described in the CRMP Memorandum of Understanding.

25.2.2 State

California Public Resource Code, Sections 5093.50-5093.70

Sections 5093.50–5093.70 were added to the PRC in 1972, through enactment of the California Wild and Scenic Rivers Act, to preserve certain rivers that possess extraordinary scenic, recreational, fishery, or wildlife values in their free-flowing state. The PRC identifies, classifies, and provides protection for specific rivers or river segments, as approved by the legislature. Rivers or river segments that are specifically identified and classified in the PRC comprise the State Wild and Scenic Rivers System. As described in Section 5093.50, rivers or river segments included in the State system must possess "extraordinary scenic, recreational, fishery, or wildlife values"; the PRC does not define what constitutes "extraordinary."

Various amendments to the California Wild and Scenic Rivers Act have been passed, adding related legislation to the PRC. In 1986, Assembly Bill (AB) 3101 (Statutes 1986, Chapter 894) established a study process to help determine eligibility for potential additions to the State system (PRC Section 5093.547 and Section 5093.548). Additionally, protection for river segments can be provided without formally identifying them as part of the State system.

In 1989, an amendment to the California Wild and Scenic Rivers Act was passed, adding Section 5093.542 to the PRC to protect the McCloud River fishery, which it describes as "one of the finest wild trout fisheries in the state." It further declares that "The continued management of river resources in their existing natural condition represents the best way to protect the unique fishery of the McCloud River" and that "maintaining the McCloud River in its free-flowing condition to protect its fishery is the highest and most beneficial use of the waters of the McCloud River." The amendment provides protection to the McCloud River fishery and its "natural" and "free-flowing" condition from Algoma to the confluence with Huckleberry Creek (upper McCloud River), and 0.25 mile downstream from the McCloud Dam to the McCloud River Bridge (lower McCloud River). Although the Legislature declared that the McCloud River possessed "extraordinary resources" in the context of the PRC, the Legislature's action stopped short of formally designating the river as wild and scenic.

In addition, the State PRC is also relevant to the recently passed Proposition 1, "Water Bond. Funding for Water Quality, Supply, Treatment, and Storage Projects," for $7.5 billion, which includes $2.7 billion for storage projects. Proposition 1, section 79751 specifies:

> *Projects for which the public benefits are eligible for funding under this chapter consist of only the following:*
>
> *(a) Surface storage projects identified in the CALFED Bay-Delta Program Record of Decision, dated August 28, 2000,*

> *except for projects prohibited by Chapter 1.4 (commencing with Section 5093.50) of Division 5 of the Public Resources Code.*

Section 79751 does not amend or modify the State PRC. Whether the State of California can use Proposition 1 funds in support of any alternative potentially authorized related to enlargement of Shasta Dam and Reservoir is outside of Reclamation's authority and to be determined by the State of California.

Several key terms in the State PRC are used, but not fully defined with respect to protection of the McCloud River. This chapter adopts the definition of free-flowing as defined in the Federal Wild and Scenic Rivers Act. While the State PRC does not specifically define "Wild Trout Fishery", CDFW does identify several key elements that are relevant to and useful in developing a working definition of a wild trout fishery as it relates to this discussion. Fishery is a generally accepted term referring to an activity leading to the harvesting or use of a fishery resource (e.g., fishing, aquaculture) (CDFG 2003). It also includes a more inclusive definition that relates to the ecological conditions that provide fish habitat and self-sustaining populations (e.g., wild trout) (CDFG 2003).

25.3 Affected Environment

This section defines "affected environment" as the wild and scenic characteristics of the lower McCloud River that could be affected by the proposed modifications to Shasta Dam and Shasta Lake. It briefly describes the McCloud River from its headwaters to the McCloud Arm of Shasta Lake. It then describes the wild and scenic values of Segment 4 identified in the USFS evaluation and the values provided protection in the PRC.

Descriptions of the river and its characteristics were derived primarily from the following sources:

- Wild and Scenic Rivers Evaluation, Appendix E to the EIS for the Shasta-Trinity National Forest Land and Resources Management Plan (USFS 1994)
- Lower McCloud River and McCloud Arm Watershed Analyses (USFS 1998a and 1998b)
- McCloud River Wild and Scenic River Report (Jones & Stokes Associates 1988)
- Lower McCloud River Wild Trout Area Fishery Management Plan, 2004 through 2009 (Rode and Dean 2004)
- Lower McCloud River Habitat Typing Report (USFS 2001)

25.3.1 The McCloud River

McCloud River Basin

The McCloud River basin drains an area of approximately 800 square miles (USFS 1998a) in northern Shasta County and southern Siskiyou County, southeast of Mount Shasta. The river originates in an area of the STNF near Colby Meadows at approximately 4,250 feet above msl (Rode and Dean 2004). From its headwaters to Shasta Lake, the river is approximately 59 miles long. McCloud Reservoir, part of PG&E's McCloud-Pit Hydroelectric Project, separates the upper river from the lower river. The lower McCloud River transitions into the McCloud Arm of Shasta Lake upstream from the McCloud River Bridge (Figure 25-3).

Upper McCloud River

The upper McCloud River is an approximately 36-mile reach from the river's origins at Colby Meadows downstream to the transition with McCloud Reservoir. The river basin above the reservoir drains an area of approximately 403 square miles. Mean monthly flows in the upper McCloud River range from 766 cubic feet per second (cfs) in October to over 1,000 cfs in March, April, and May (PG&E 2006).

McCloud Reservoir

The McCloud Reservoir is a major component of PG&E's McCloud-Pit Hydroelectric Project, which was constructed in 1965 and operates under license from the Federal Energy Regulatory Commission (FERC). The McCloud Reservoir is approximately 5 miles long and has a storage capacity of approximately 35,200 acre-feet of water. The McCloud-Pit Hydroelectric Project diverts approximately 75 percent of the upper McCloud River's flow through a pipeline to Iron Canyon Reservoir, then conveys it downslope and discharges it into the Pit River at the Pit 6 powerhouse, upstream from the Pit River Arm of Shasta Lake (PG&E 2006). The remaining 25 percent of flows provide base flow for the lower McCloud River, a considerable reduction from historic flow volumes (Jones & Stokes Associates 1988).

Lower McCloud River

The lower McCloud River flows southwesterly through a deep canyon with steep slopes approximately 22 miles from McCloud Dam downstream to the transition with Shasta Lake. Vegetation along the lower river is predominately mixed-conifer and Douglas-fir forest. This stretch of river receives runoff from a 404-square-mile area of the lower McCloud River basin and the 95-square-mile Squaw Valley Creek basin. It provides exceptional fishing opportunities and includes two long-established fishing clubs, the Bollibokka Club and the McCloud River Club. The Nature Conservancy's McCloud River Preserve also encompasses a portion of the lower McCloud River.

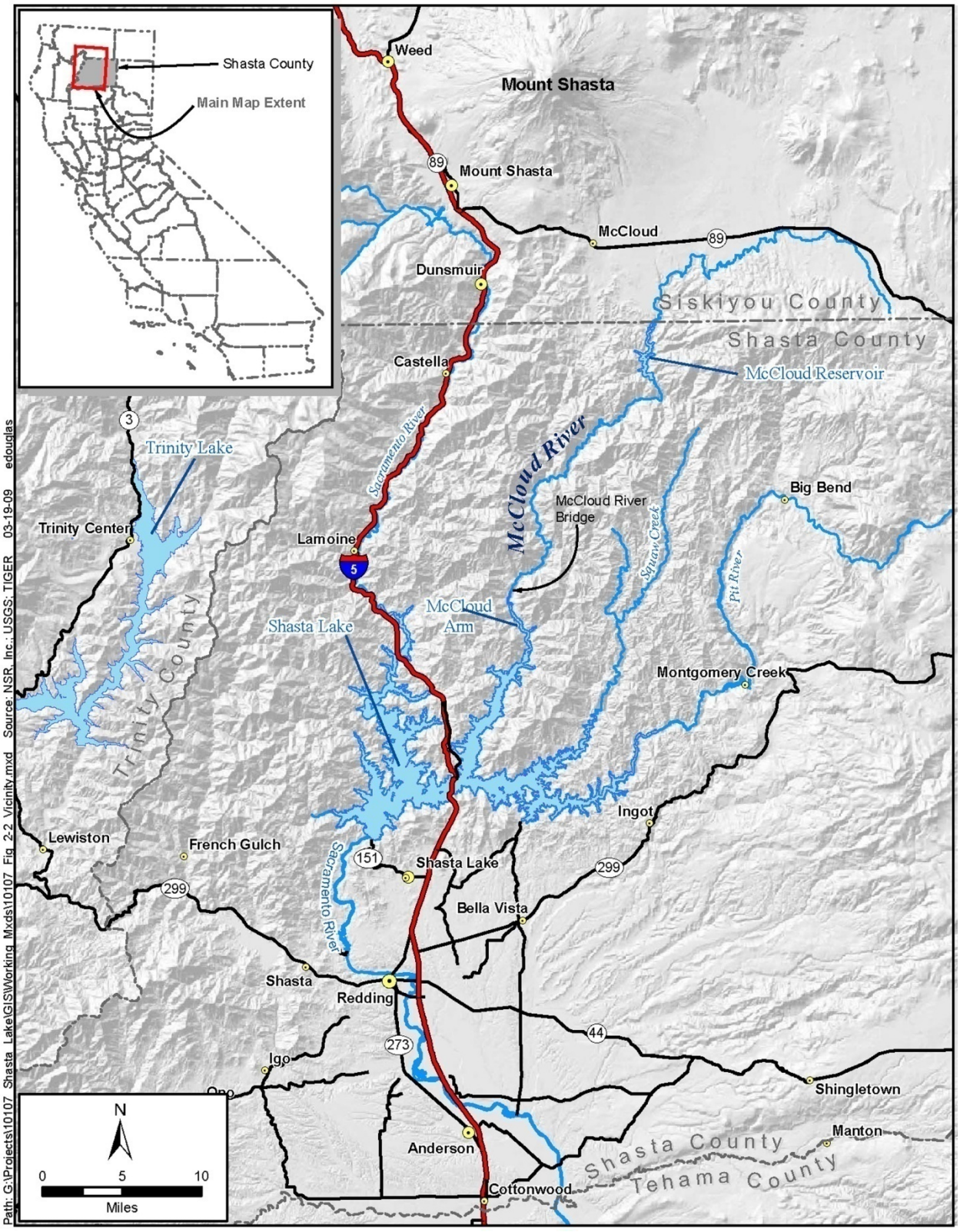

Figure 25-3. Regional Location

Flows in the lower McCloud River have been controlled by releases from McCloud Dam since 1965 (PG&E 2006). Under its current FERC license, PG&E's McCloud-Pit Hydroelectric Project maintains a minimum instream flow of 50 cfs from May through November and 40 cfs from December through April through controlled releases. Accordingly, flows in the lower McCloud River are highly regulated, and annual flows in the river below McCloud Dam do not follow a pattern typical of an unimpaired mountain river in northern California. Before dam construction, flows in the lower river were considerably higher, estimated to be in the range of 924 to 1,245 cfs (mean monthly flows) from June to October (Jones & Stokes Associates 1988, citing U.S. Geological Survey (USGS) for the period of 1967 to 1985).

McCloud Arm of Shasta Lake

The construction of Shasta Dam between 1938 and 1945 converted part of the lower McCloud River into the McCloud Arm of Shasta Lake. The McCloud Arm is more than 16 miles long, with approximately 70 miles of shoreline. It drains an area of approximately 41,000 acres (USFS 1998b). Water levels in the arm fluctuate with the lake's water levels, and during periods of lower water levels, a water line, known as the "bathtub ring," is evident along the banks; this bathtub ring extends about 1 mile upstream from the McCloud River Bridge. During extended periods of lower water levels, vegetation may become established on the exposed banks.

The upper extent of the lake encompasses the transition reach, which varies between about 920 and 1,070 feet msl. Because of the effects of Shasta Lake on the McCloud Arm, the STNF determined that the transition reach did not meet the eligibility requirements of a wild and scenic river (USFS 1994). The USFS defined the upper limit of the McCloud Arm as an elevation of 1,070 feet, or approximately 5,400 feet above the McCloud River Bridge. This elevation corresponds to the lower limit of Segment 4 as defined in the STNF LRMP. A portion of the transition reach – from the McCloud River Bridge to the 1,070-foot elevation – is included in the segments of the river provided protection under the PRC.

The transition reach provides a corridor for fish migrating between Shasta Lake and the lower McCloud River and contributes to the unique fishery of the river. Common fish in the McCloud Arm include native species such as rainbow trout, riffle sculpin, and speckled dace, as well as non-native species (e.g., brown trout, spotted bass) (North State Resources, Inc. 2008).

Water temperatures in the McCloud Arm become warmer as the river transitions to Shasta Lake. The warmer temperatures associated with Shasta Lake support warmwater fish, but the cooler temperatures of the transition reach may prevent some fish from migrating upstream into the lower river. Water temperatures in the transition reach may be suitable for warmwater species.

25.3.2 The McCloud River's Wild and Scenic Values

This section focuses on the wild and scenic river characteristics and ORVs of the lower McCloud River identified by the USFS in the wild and scenic river evaluation performed for the STNF LRMP (USFS 1994) and the wild and scenic river characteristics and extraordinary value protected under the PRC.

The McCloud River's fishery and its free-flowing condition are identified in both the USFS evaluation and the PRC. These characteristics are discussed first, followed by a discussion of the wild and scenic characteristics and values – water quality, geology, cultural/historical resources, and visual quality/scenery – that are identified only in the USFS evaluation.

Throughout the SLWRI planning process, Reclamation has worked closely with private landowners to collect information, perform technical investigations, and incorporate the best available science to support this EIS. Since the DEIS was prepared, information included in Chapters 11, 12, 13, and 25 of this EIS has been updated to include data from recent surveys and investigations performed on both Federal and private lands in the general vicinity of Shasta Lake. Reclamation worked closely with private land owners, including the signatories to the CRMP, to incorporate available information on the McCloud River into this EIS. The following section includes a brief description of the current transition reach (see Figure 25-1) because the reach of the river that would be newly inundated would likely take on the characteristics of the existing transition reach.

Fishery

The fishery of the lower McCloud River is unique; the river is considered a premier trout fishery and is managed according to CDFW's wild trout policy for the reach from Algoma Campground downstream to the lower end of the Nature Conservancy property, despite the ongoing effects of McCloud Dam and Shasta Lake on the river's flows and water quality, and the more recent impacts of the 2012 Bagley Fire on the lower McCloud River watershed. To characterize the fishery, this section includes descriptions of the aquatic habitat in USFS Segment 4, the Resources Agency's Segment 10, and the transition reach as well as the fish species that inhabit the study area.

Aquatic Habitat The lower McCloud River is characterized as a series of alternating riffles, pools, and cascading pocket water occurring along a broad, boulder-studded river channel within a confined, heavily timbered valley. A narrow band of montane riparian vegetation (typically less than 25 feet wide) dominated by willows, white alders, and Oregon ash occurs along the river banks adjacent to steep hill slopes with mixed conifer-Douglas-fir forest (USFS 2001).

In 2001, the USFS prepared a Habitat Typing Report to characterize aquatic habitats in the lower McCloud River from the McCloud River Bridge to McCloud Dam. The report divided the lower river into four reaches: McCloud

Dam to Ladybug Creek, Ladybug Creek to Clairborne Creek, Clairborne Creek to Tuna Creek, and Tuna Creek to McCloud River Bridge. The reach from Tuna Creek to McCloud River Bridge includes all of Segment 4 and nearly all of Segment 10, including the portion of the transition reach that is part of Segment 10. Data are not available for the transition reach below the McCloud River Bridge downstream to Shasta Lake.

The dominant aquatic habitat in the reach of the lower river from Tuna Creek to McCloud River Bridge includes runs (20 percent), mid-channel pools (18 percent), low-gradient riffles (18 percent), lateral scour pools from bedrock (11 percent), and pocket water (10 percent) (USFS 2001). This reach provides most of the corner pool (100 percent), glide (89 percent), and cascade (50 percent) habitats in the lower McCloud River.

The portion of the transition reach upstream from McCloud River Bridge is dominated by low-gradient riffles and mid-channel pools, with some pocket water, glides, runs, and lateral scour pools. Glide habitat is the dominant aquatic habitat between the 1,070-foot and 1,080-foot elevations, and pocket water is the dominant aquatic habitat between the 1,080-foot and 1,090-foot elevations. The habitat within the current transition reach represents a fraction of the total available aquatic habitat within the lower McCloud River and provides a small portion of the habitats within the reach from the McCloud River Bridge to Tuna Creek.

The diversity of riffles, flatwater habitat, and pools is influenced by the presence of boulders and cobble substrate and variations in flow conditions. The lower river is dominated by boulders with pockets of gravel present at pool tailouts and in velocity breaks behind large boulders. The riffles are generally higher gradient channel sections with turbulent surface flow and uniform cobble and boulder substrates. While swift pocket water in the lower McCloud River often appears more like a riffle than a run, the habitable eddies, or pockets, created behind the boulders that characterize this habitat type make it functionally more similar to the other flatwater habitats (USFS 2001). Typically, flatwater and pools are the principal habitats used by the trout in the McCloud River for rearing and feeding (Wales 1939, Rode and Dean 2004, USFS 2001).

The USFS (2001) reported that the aquatic habitat within the transition reach has undergone type conversions caused by aggradation and scour of sediments for about 3,700 feet upstream from the McCloud River Bridge. When Shasta Lake is drawn down, large, wide, low-gradient riffles with channel braiding dominate in this reach. When the lake is at full pool and at intermediate levels of drawdown, the transition reach becomes inundated, but a unidirectional current created by the lower McCloud River's inflow is detectable throughout the inundation zone, slowing as it approaches the flat water of Shasta Lake. To varying degrees, this fluctuating backwater effect converts this reach to a deep,

wide, slow-moving riverine habitat transitioning to lacustrine habitat near the bottom of the transition reach.

Fish Species The current composition and distribution of fish species inhabiting the lower McCloud River and Shasta Lake reflect the historic fishery, the operational effects of Shasta Dam and McCloud Dam, and the introduction of nonnative fish species into the river and Shasta Lake. The completion of Shasta Dam in 1945 eliminated all runs of anadromous fish in the river (Rode and Dean 2004). The historic fishery included Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss irideus*), rainbow trout, and the only known California occurrence of the bull trout. The bull trout is believed to have been extirpated from the lower McCloud River and is possibly extinct in California. Today, the fishery is dominated by rainbow trout and brown trout, an introduced species that migrates between Shasta Lake and the lower McCloud River. Other nonnative species also migrate up the lower McCloud River, including spotted bass (*Micropterus punctulatus*), but bass have not been confirmed upstream from Tuna Falls, a high-gradient rapid at the confluence with Tuna Creek. Despite the change in fish species in this 22-mile reach, the lower McCloud River is still considered one of California's premier trout streams.

Fish observed in the river downstream from the Tuna Creek confluence during a survey conducted in summer 2007 included rainbow trout, spotted bass, speckled dace (*Rhinichthys osculus*), sculpin spp. (*Cottus* spp.), Sacramento sucker (*Catostomus occidentalis*), and Sacramento pikeminnow (*Ptychocheilus grandis*) (North State Resources, Inc. 2008). Other fish that occur in this reach include brown trout, brook trout (*Salvelinus fontinalis*), hardhead (*Mylopharodon conocephalus*), and smallmouth bass (*Micropterus dolomieui*). The status of the riverine fish species of the lower McCloud River is identified in Table 25-1.

Rainbow Trout Fluvial and adfluvial populations of rainbow trout use the habitat available throughout the lower McCloud River. The McCloud River rainbow trout became known as "the rainbow of the fish culturist" because eggs from that population accounted for transplants of rainbow trout in the 1880s to the eastern states and several other countries.

The rainbow trout that inhabit the McCloud River are a vigorous, active fish that primarily inhabit swifter portions of pool and pocket water habitats. Adults migrate into the lower McCloud River from Shasta Lake in the spring and fall months, presumably to spawn. Suitable spawning habitat in the study area is limited, and the trout likely migrate further upstream to spawn (North State Resources, Inc. 2008).

Although the genetic origin of these fish has not been evaluated, the numerous strains of rainbow trout planted in Shasta Lake over the years have likely resulted in some introgression among migratory rainbow trout in the lower McCloud River. The degree to which this migratory population of rainbow trout

contributes to the native trout fishery of the river is not specifically known; however, available data do not indicate that it is substantial.

Table 25-1. Riverine Fish Species of the Lower McCloud River

Species	Current Status	Comments
Sacramento sucker (*Catostomus occidentalis*)	Common	Native, non-game species, observed during 2007 surveys
Riffle sculpin (*Cottus gulosus*)	Common	Native, non-game species, observed during 2007 surveys
Smallmouth bass (*Micropterus dolomieui*)	Uncommon	Introduced sport species in Shasta Lake, moves into lower river from lake, warmwater species
Spotted bass (*Micropterus punctulatus*)	Uncommon	Introduced sport species in Shasta Lake, moves into lower river from lake, observed during 2007 surveys, warmwater species
Hardhead (*Mylopharodon conocephalus*)	Uncommon	Native, non-game species
Rainbow trout (*Oncorhynchus mykiss*)	Abundant	Native trout species, subject to special angling regulations, coldwater species, observed during 2007 surveys
Sacramento squawfish (=pikeminnow) (*Ptychocheilus grandis*)	Common	Native, non-game species, observed during 2007 surveys
Speckled dace (*Rhinichthys osculus*)	Common	Observed during 2007 surveys
Brown trout (*Salmo trutta*)	Common	Introduced sport species found throughout the river, migrates from Shasta Lake to spawn in lower river, subject to special angling regulations, coldwater species
Bull trout (*Salvelinus confluentus*)	CE; Extinct	Native, believed extirpated from entire river by mid-1970s, a few restoration experiments performed in upper river tributaries, coldwater species
Brook trout (*Salvelinus fontinalis*)	Rare	Introduced sport species, stocking in upper river and tributaries discontinued, very rarely observed in lower river, coldwater species

Sources: Wales 1939, Tippets and Moyle 1978, Rode and Dean 2004, Moyle 2002, CDFW, unpublished data, North State Resources, Inc. 2008
Key:
CE = California Endangered
CDFW = California Department of Fish and Wildlife

Rainbow trout typically mature in their second to third year and move upstream to spawn in the lower McCloud River and its tributaries from February to June. The eggs typically hatch in 3 to 4 weeks, depending on water temperature, and fry emerge 2 to 3 weeks later. The fry remain in quiet waters close to shore, among cobbles, or under overhanging vegetation for several weeks. As the fish grow, they move into swifter water habitats.

In the river, this species forms feeding station hierarchies, which they aggressively defend, and prey on aquatic and terrestrial insects drifting in the current. They also eat active bottom invertebrates. It has been reported that

McCloud River rainbow trout tend to be more bottom-oriented when feeding than rainbow trout elsewhere.

In reservoirs, rainbow trout form loose schools and feed on both invertebrates and other fish, although fish dominate their diet as they grow larger. Preferred prey in Shasta Lake is the threadfin shad. Trout growth in Shasta Lake is more rapid than for fluvial trout. The optimum temperature range for growth and for completion of most life stages of rainbow trout is between 50 and 70 degrees Fahrenheit (°F), though they seem to prefer and thrive at temperatures in the lower two-thirds of this range. Rainbow trout in lakes and streams seldom live for more than 6 years.

Brown Trout Like the rainbow trout, fluvial and adfluvial populations of non-native brown trout use habitat throughout the lower McCloud River, but this species migrates more between the lake and river. It is not as abundant as the rainbow trout. CDFW biologists suggest that this species occupies an ecological niche previously occupied by bull trout in the lower McCloud River (Rode and Dean 2004).

Only some of the brown trout migrating from Shasta Lake that passed a lower river counting weir were observed upstream in the CDFW Wild Trout Management Area (Segments 7, 8, 9, and 10), so the actual extent of the spawning grounds of migratory brown trout is not fully known.

Brown trout mature in their second or third year. Some fish may mature in the river while others may migrate to Shasta Lake to feed, returning to spawn on a recurring basis. The stimulus for upstream migration is often a rise in stream flow or changing lake temperatures. Spawning takes place from November through December when water temperatures fall below 50°F. Eggs typically hatch within 7 to 8 weeks, depending on water temperature. Fry emerge from the gravel 3 to 6 weeks later. The habitats used by juvenile brown trout are similar to those used by rainbow trout; however, as brown trout grow, they tend to select habitats with slower water and more cover. In the riverine environment, brown trout prefer slow, deep pools with abundant boulder and bedrock ledge cover. The timing of emigration of juvenile brown trout to Shasta Lake is not known.

Fluvial brown trout have diets similar to those of rainbow trout, but appear to feed more on the stream bottom for benthic prey than rainbows. As brown trout grow, their diet expands to include larger invertebrate prey and fish. Larger brown trout are voracious predators, especially on fish, including young salmonids. In Shasta Lake, adult brown trout prefer threadfin shad as a staple prey.

Brown trout growth in the lower McCloud River appears to increase after age 3, which has been attributed to their migration to Shasta Lake to exploit the forage fish populations. Brown trout growth is best at temperatures ranging from 45 to

69°F, though they seem to prefer and dominate other trout species near the upper half of this range.

Spotted Bass and Smallmouth Bass Black basses and other sunfishes dominate in the littoral zones of Shasta Lake. Spotted bass and smallmouth bass are now the most common species of black bass in Shasta Lake, with spotted bass having become most frequent over the past 20 years. Both spotted and smallmouth bass occupy shallow, low-gradient habitat offered by Shasta Lake and its tributaries. They can be found throughout Shasta Lake and in the lower ends of the main tributary streams, including the lower McCloud River. However, the extent to which black bass have colonized the lower McCloud River is not currently known.

Smallmouth bass and spotted bass share similar life histories, and these similarities may account for their persistence in Shasta Lake compared to that of largemouth bass, which have declined in numbers. Both smallmouth and spotted bass mature in their second or third year and spawn in the late spring. Smallmouth will spawn at cooler temperatures (55 to 61°F) than spotted bass (greater than or equal to 65°F). Both species seek quiet shallow areas over mud, sand, gravel, and rocky, debris-littered bottoms to spawn in both lakes and streams. This type of spawning habitat is available in the transition reach of the lower McCloud River, especially when lake levels are high.

Juvenile bass feed on small invertebrates until they are large enough to prey on small fish and large invertebrates. Temperature preferences and optimal growth for both species of black basses is attained in the range from 68 to 81°F. Because of the year-round cool temperatures (less than or equal to 68°F) of the lower McCloud River, temperatures preferred by bass only occur during the late summer and early fall months upstream from the transition reach. Therefore, the temperature regime of the lower McCloud River may limit intrusions of bass from the lake. However, spotted bass were observed in the lower river below the confluence of Tuna Creek during summer fish surveys (North State Resources, Inc. 2008).

Free-Flowing Condition

The Federal WSRA defines *free flowing* as “existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway” (16 USC Section 1286). The PRC defines free-flowing as “existing or flowing without artificial impoundment, diversion, or other modification of the river.” It states, however, that the “presence of low dams, diversion works, and other minor structures does not automatically bar a river’s inclusion in the system.”

Base flows in the lower McCloud River are partially controlled by releases from McCloud Reservoir in accordance with PG&E’s FERC license and include precipitation and inflow from tributaries. The lower McCloud River experiences seasonal fluctuations and large variations in base flows (USFS 1998a). Releases

from McCloud Reservoir into the lower river are heavily regulated, with a minimum release requirement of 50 cfs from May through November and 40 cfs from December through April; the releases are typically well above these minimum requirements and tend to stay above 100 cfs (USFS 1998a). Tributary contributions are the most noticeable flows during storm events, but are substantially reduced during low-flow conditions. Because of the minimum release requirements from McCloud Reservoir, spring and summer flows are considerably more stable than they would be under unregulated conditions.

PG&E monitors lower McCloud River flows in accordance with its FERC license at a gaging station in Segment 4 upstream from Shasta Lake (0.2 mile downstream from Big Bollibokka Creek); the most recent available water data record covers the water year October 2012–September 2013 (USGS 2013). For this period, measured mean monthly flows ranged from 271 cfs in August to a high of 26,179 cfs in February, with maximum flows as high as 30,100 cfs on December 2, 2012.

Over the course of the year, the transition from lake to river expands and contracts over a distance of about 1.7 miles due to changing water levels in Shasta Lake (Figure 25-2). During April and May of wet years, the transition reach extends about 1 mile (5,400 feet) upstream from the McCloud River Bridge to the full pool elevation of 1,070 feet msl, the downstream boundary of Segment 4. As described in Chapter 6, “Hydrology, Hydraulics, and Water Management” Shasta Lake reaches full-pool elevation about one year in three.

Despite upstream and downstream dams and diversions, the lower McCloud River meets the definition of a free-flowing river under both the Federal WSRA and PRC.

Water Quality

The water quality of the lower McCloud River is influenced by natural processes and land use activities, including PG&E’s McCloud-Pit Hydroelectric Project, timber management activities, and roads. Overall, the water quality of the river is rated as good (USFS 1998). Glacial silt gives the river “a beautiful turquoise color typical of rivers draining glacial valleys in British Columbia and Alaska” (Jones & Stokes Associates 1998).

Turbidity and water temperature are two important factors that influence the water quality of the river and affect aquatic habitat. Turbidity is caused by suspended sediment transported from upstream waters and in surface runoff, particularly from disturbed landscapes, such as areas burned by fire, timber harvest areas or roads. Water temperature is affected by a variety of conditions, such as river flows, solar radiation, and density of vegetation along the river, but is closely tied to the temperature of the flows released from the McCloud Reservoir.

The turbidity of the lower McCloud River is influenced by the water quality and water levels of the McCloud Reservoir and runoff from upland areas throughout the basin. Turbidity levels are generally low during most of the year, ranging from 5–10 nephelometric turbidity units, but can spike to more than 900 units during periods of intense rainfall and flood flows (PG&E 2006).

Sediment becomes trapped at McCloud Dam and is released into the lower river during large storm events, temporarily increasing turbidity levels, especially in the upper segments of the lower river. Testing of the McCloud Dam bypass valve can cause high turbidity for a short period when sediment is discharged from the reservoir into the lower McCloud River. Surface runoff, especially after the first storms of the wet season, can contribute large amounts of turbid runoff from upland areas.

The length of the transition reach depends on the water year type. As the transition reach moves upstream, sediment within the reach is remobilized and turbidity levels respond accordingly. Periodic fluctuations in water levels can result in erosion along the banks and localized increases in turbidity levels in the transition reach and the McCloud Arm.

The year-round cool water temperature regime of the lower McCloud River inhibits the productivity of its fishery, but provides high-quality holding habitat for salmonids, contributing to the river's unique value as a tributary to Shasta Lake. The controlled releases from McCloud Dam appear to have a direct bearing on the water temperatures downstream. Water temperatures tend to be higher in Segment 4 than immediately below McCloud Dam. Data recorded at PG&E's monitoring station on the river just upstream from Shasta Lake (0.2 mile downstream from Big Bollibokka Creek) indicate that water temperature ranges from the high 30s to the upper 60s (°F), with lower temperatures in the winter and higher temperatures in the summer (PG&E 2006).

The infusion of cooler water from the lower McCloud River influences water temperatures in the transition reach throughout the year. The degree of influence depends on the amount of discharge from the river and Shasta Lake levels. The temperatures throughout the lower McCloud River also control to some degree the distribution of the warmwater fishery known to occupy the river below Tuna Falls.

Outstandingly Remarkable Values Identified in USFS Evaluation

Cultural/Historical Resources Cultural resources include archaeological sites, historical structures and sites, and areas of religious or cultural significance to Native Americans. Significant resources that provide important information on the prehistory and history of an area or that are considered sacred to Native Americans can contribute to wild and scenic river values.

The McCloud River basin was part of a major center of occupation by the Wintu people, who occupied the McCloud River area at the time of Euro-

American contact in the 1800s. Although much of the Wintu territory was overrun with miners and other opportunistic Euro-Americans, the lower McCloud River was left largely untouched due in part to a lack of easily mined materials and the ruggedness of the terrain (Yoshiyama and Fisher 2001), but also because of the resistance of the Wintu to incursions into their territory. Because of its generally undisturbed nature, the significance of the lower McCloud River to prehistoric and ethnographic records of this area of California's history is considered to be great (Jones & Stokes Associates 1988).

Within the 0.25-mile corridor deemed eligible by the USFS, three formally recorded sites and other known sites contribute to the lower river's ORVs because they provide important information on the use of the area from before the Late Archaic Period (1300 to 150 before present, calibrated using radiocarbon dating) to the Historic Era (1840 to present). Three Wintu villages, called Tsekerenwaitsogi, Klolwakut, and Boloibaki, are thought to have been located in the general area of the present-day Bollibokka Club headquarters (Guilford-Kardell 1980), which is part of the former Wintu territory. These villages likely represent the typical lifestyle of the Wintu at the time of Euro-American contact, when they lived in permanent villages near rivers and streams and were semi-sedentary, foraging people (DuBois 1935). As part of the Wintu occupation of this area, prehistoric, historic, and modern Traditional Cultural Properties, sacred locations, and important use areas are located throughout the lower McCloud River basin (outside of the 0.25 mile corridor), including features such as mountains, unique landforms, caves, distinctive rock outcrops, waterfalls, pools, springs, and resource gathering areas.

Point McCloud Bridge (known as McCloud River Bridge in this chapter) is a historical resource that was constructed in 1940 and altered in 1986; the bridge would be subject to relocation in conjunction with SLWRI activities. The Bollibokka Club is a historical resource located on the north bank of the river between the confluence of Big Bollibokka Creek on the east and Wittawaket Creek on the west. Buildings associated with the club were built between the 1860s and 1920s by Austin and Rueben Hills, the founders of Hill's Brothers Coffee, and previous owners (Lucas and Stienstra 2007). A log cabin dates from the 1860s, and other structures date from the ownership of the Hills Family, including the clubhouse built in 1924 and a structure built of river cobble in 1915 (Whitney 2004). Although these resources could be eligible for listing on the National Register of Historic Places, they have not been formally evaluated.

The fishery of the lower McCloud River was also very important to prehistoric and historic uses of the area. The Native Americans in the lower McCloud River basin conducted communal fish drives of salmon or steelhead at night, which brought together many communities and provided opportunities for trade and social networking, including the parsing out of the catch among the people and villages involved (DuBois 1935). Fish, including salmon, steelhead, Sacramento sucker, freshwater shellfish, and lamprey, were an important part of the Native American diet in this area. When the northern mines opened in the 1800s,

settlers moved into the area, and the McCloud River and other rivers' fisheries provided important sources of food. In the early years of settlement, fish and game in the area were used for subsistence; however, this changed with the formation of the State of California and increased fishery management and recreational fishing.

Geology The lower McCloud River flows through a number of geologic formations, including the McCloud Limestone formation. This formation contains fossilized remains of invertebrate and vertebrate fauna that provide important scientific information on the history of California, and it has a high potential for research. According to the USFS (1998b), the limestone features exposed at a number of locations around Shasta Lake are unique and contribute to worldwide paleontological knowledge. The McCloud Limestone contains 36 species of corals, some of which may form the basis of a new taxonomic group.

Because of its very diverse fossil faunas, the mountainous terrain between the McCloud and Pit arms of Shasta Lake is perhaps California's single most important area for paleontological research (Munthe and Hirschfield 1978, cited in USFS 1998b). The limestone outcrops on the ridge immediately northwest of McCloud River Bridge (several hundred vertical feet above Shasta Lake) have produced several large Mississippian and Pennsylvanian invertebrate faunas. Because this period is poorly represented on the West Coast, this fossiliferous limestone is important to understanding the late Paleozoic evolution in this part of the country (USFS 1998b). Limestone outcrops adjacent to the McCloud Arm also provide habitat for several special-status species, such as Shasta salamander, Shasta eupatorium, Howell's cliff-maids, and Shasta snow-wreath (Reclamation 2003).

Exposed outcrops of the limestone formation are visible from the lower McCloud River in and upslope of the transition reach and contribute to its scenic values.

Visual Quality/Scenery The visual setting of the lower McCloud River upstream from Shasta Lake includes views of the river, limestone rock outcrops, adjacent coniferous and oak forests, and infrastructure associated with the Bollibokka and McCloud River clubs. A USGS stream gage has also been in place for a number of years. The pristine nature of the lower river provides for high-quality scenic views. However, the scenic views of the lower McCloud River are enjoyed by only a limited number of viewers, consisting primarily of private landowners, club members, and their guests.

Views of the river include "picturesque cascading whitewater, and deep, long, green- or turquoise-colored pools," with Douglas-fir and black and canyon oaks dominating the steep slopes and hillsides along the river (Jones & Stokes Associates 1988). Several buildings are present at the Bollibokka Club headquarters, but these structures blend in with the visual setting. The transition reach exhibits some evidence of fluctuating surface water elevations associated

with changes in water levels of Shasta Lake. Areas that are noticeably affected by the reservoir levels exhibit "a bathtub ring of steep, treeless slopes with occasional deposits of alluvium."

The scenic views make most of the lower McCloud River, including Segment 4, eligible as a scenic river under the Federal WSRA (USFS 1994). To be classified as a scenic river, the river must be free of impoundments, be accessible in places by roads, and have a river basin/shoreline that is largely undeveloped. Segment 4 does not contain any human-made or other impoundments that affect its free-flowing conditions. Roads to the Bollibokka Club provide access to portions of Segment 4 for members of the club and their guests. Currently, public access is limited to pedestrians on USFS lands along the shoreline of Shasta Lake. For these reasons, the USFS has determined that this segment meets the eligibility requirements of a scenic river under the Federal WSRA.

25.4 Environmental Consequences and Mitigation Measures

This section identifies how the characteristics of the lower McCloud River that make it eligible for listing under the PRC and Federal WSRA could be affected by each alternative and whether the alternatives would conflict with the provisions of the STNF LRMP and the CRMP.

25.4.1 Methods and Assumptions

This analysis of environmental consequences focuses on the effects of proposed modifications to Shasta Dam and Shasta Lake on the McCloud River's free-flowing conditions, its water quality, and the ORVs (cultural resources, fisheries, geology, and scenery) that make it eligible for listing as a wild and scenic river under the Federal WSRA. In large part, the environmental effects are based on computer modeling of water levels, known elevations of the existing bathtub ring that is observable in the transition reach, and the anticipated changes in the environment due to fluctuations in water levels and expansion of the transition reach. Physical effects to the free-flowing conditions, water quality, and ORVs are analyzed in terms of their effects on the eligibility of the river for wild and scenic river designation. While aquatic habitat data are used to quantify the relative impact to the fishery values, a qualitative analysis is provided for most resources because of a lack of quantitative data and the subjective nature of the values. Information to support the analysis was generated from available literature and planning documents and technical studies prepared as part of the SLWRI as well as other chapters in this EIS.

CalSim Modeling

The CalSim-II computer model was used to assist in the evaluation of the potential impacts of the project alternatives on water-related resources. The model used historical data on California hydrology to represent the variety of

weather and hydrologic patterns, including wet periods and droughts, under which water storage and conveyance facilities would be operated. Two scenarios (base cases) of demands for, and storage and conveyance of, water were used in model runs: 2005 facilities and demands ("existing conditions") and forecasted 2030 demands and reasonably foreseeable projects and facilities ("future conditions"). A model run was conducted for each of these base cases combined with each alternative so that the effects of the No-Action Alternative and the action alternatives could be evaluated for both existing and future conditions.

The analysis focuses on the environmental effects in the portion of Segment 4 that would periodically be inundated. These effects are discussed in the following section.

Gage Data

PG&E, in coordination with USGS, monitors lower McCloud River flows in accordance with its FERC license for the McCloud-Pit Hydroelectric Project at a gaging station just upstream from the McCloud River Bridge, approximately 0.2 mile downstream from Big Bollibokka Creek (USGS 11368000 McCloud River above Shasta Lake, California). The station measures mean, minimum, and maximum monthly flows in the lower McCloud River. The most recent available water data record covers the water year of October 2012 to September 2013 (USGS 2013). This data was used to describe flow conditions in the lower McCloud River.

Water Quality Monitoring

Current and historical water quality monitoring data for the McCloud River have been collected by Federal and state agencies as well as PG&E and The Nature Conservancy. The California Department of Water Resources maintains water quality information on the McCloud River in the California Data Exchange Center database. The Nature Conservancy monitors water quality at the McCloud River Preserve. Water quality monitoring of the lower McCloud River includes measures of water temperature, dissolved oxygen, pH, specific conductance, and turbidity, as well as correlated data on weather, air temperature, and debris movement. PG&E monitors water quality in compliance with its FERC license. Available information on water quality was used to describe the setting of the lower river and assess changes in water quality that would occur as a result of the Shasta Dam modification alternatives.

Habitat Typing

The USFS stream habitat typing performed in 1999 and 2000 (STNF, December 2001 unpublished data report, as found in USFS 2001) was used to describe aquatic habitat in the lower McCloud River and to assess the changes in aquatic habitat from implementation of the Shasta Dam modification alternatives. The habitat typing data were used in conjunction with the CalSim-II modeling results, digitized orthophotographs, and high-resolution topographic data to provide habitat maps and graphic depictions of the distribution of aquatic

habitat in the lower river below Little Bollibokka Creek. A longitudinal profile, using water surface elevations, was generated to illustrate habitats; it does not provide an accurate representation of channel geometry.

A quantitative evaluation of the aquatic habitats was performed using digital images and the USFS habitat typing data in an integrated geographic information systems environment. Longitudinal habitat delineation was determined from the habitat typing data, with minor adjustments to match photo-interpreted habitat, and incorporated into the geographic information systems in conjunction with water surface elevations generated through the CalSim-II modeling results. Estimates of aquatic habitat areas were generated from digitized wetted stream perimeters. These measurements were based on orthophotographs taken April 25, 2001. While the absolute amount of riverine habitat can vary with flow, the relative proportions of different types of habitat remain relatively constant. Therefore, we used the relative proportions of aquatic habitat types to compare impacts to the transition reach with the entire lower river.

25.4.2 Criteria for Determining Significance of Effects

The following significance criteria were developed based on guidance provided by the State CEQA Guidelines, other Federal and State guidance, and consider the context and intensity of the environmental effects as required under NEPA. (Please see Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences) for an explanation of the distinction between significance under NEPA and significance under CEQA.) Impacts of an alternative on the wild and scenic river values of the lower McCloud River would be significant if project implementation would:

- Affect the eligibility for Federal listing as a wild and scenic river of any portion of the lower McCloud River above the 1,070-foot elevation
- Conflict with the STNF LRMP or with management of the McCloud River under the CRMP
- Impact the wild trout fishery and free-flowing conditions as described in the State PRC

25.4.3 Direct and Indirect Effects

No-Action Alternative

Under the No-Action Alternative, Reclamation would not pursue an action to enlarge Shasta Dam to help increase anadromous fish survival in the upper Sacramento River and address the growing water supply reliability issues in California. Water levels in Shasta Lake and the transition reach would continue to fluctuate similar to current conditions. USFS Segment 4 and the Resources Agency's Segment 10 would not be affected by this alternative.

Impact WASR-1 (No-Action): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Under the No-Action Alternative, the current maximum elevation of water levels in the transition reach would not be increased, and Segment 4 would not be affected. Fluctuations in water levels would continue to be similar to current conditions, with water levels reaching the maximum elevation of 1,070 feet msl – the downstream boundary of Segment 4 – in the transition reach for a brief period (typically a few days in May) during wet years.

The average monthly water surface of Shasta Lake would continue to fluctuate based on the water year, with a maximum elevation of 1,053 feet msl in April of an average water year and 1,070 feet msl in April and May of a wet year. These fluctuations would not affect the free-flowing conditions and water quality of Segment 4. The ORVs that make the river eligible for designation as a Federal wild and scenic river would continue to be affected only by ongoing natural processes and land use activities, and all of Segment 4 would remain eligible for listing under the Federal WSRA. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-2 (No-Action): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan Under the No-Action Alternative, the STNF LRMP would continue to be implemented as it has in the past, with no changes in the management of the McCloud River's free-flowing condition, water quality, and ORVs. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-3 (No-Action): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 Under the No-Action Alternative, the protections afforded the McCloud River by the PRC would not be affected. River conditions would not be modified, and the provisions of the PRC would continue to protect the river. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-4 (No-Action): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 Under the No-Action Alternative, the protections afforded the McCloud River by the PRC would not be affected. River conditions would not be modified, and the provisions of the PRC would continue to protect the river. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

CP1 – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

CP1 would involve a 6.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 8.5 feet and enlarge the total storage space in the lake by 256,000 acre-feet. This increase would equate to an increase of about 1,100

acres of surface area occupied by Shasta Lake when the lake is full. CP1 includes measures to increase water supply reliability while contributing to increased survival of anadromous fish. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 70,000 acre-feet and 35,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing municipal and industrial (M&I) deliveries.

Impact WASR-1 (CP1): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Under CP1, the increased gross pool of Shasta Lake would expand the current transition reach up to the 1,078-foot elevation, resulting in adverse effects on the characteristics of approximately 1,470 feet of Segment 4. The rest of the McCloud River would remain eligible for designation as a Federal wild and scenic river. This impact would be significant.

Under CP1, approximately 1,470 feet, or 11 percent, of Segment 4 would be periodically inundated. This increase in the transition reach to a maximum elevation of 1,078 feet msl would equate to a 16 percent increase over the current transition reach. The length of time during the year when the transition reach is inundated and the maximum elevation of the inundation area would vary by the type of water year (wet, above normal, below normal, average, dry, or critical).

Within the expanded transition reach, flow conditions and fisheries would periodically be affected, with the timing and duration of the effects similar to those that occur in the current transition reach. Over time, the expansion of the bathtub ring would affect water quality, geology, and visual quality/scenery in the affected portion of Segment 4. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans. These effects could reduce the total length of the lower McCloud River that is eligible for wild and scenic river designation by about 1,470 feet (approximately 1.2 percent of the total length of the lower river).

Free-Flowing Conditions Under CP1, the currently free-flowing section of the lower McCloud River would be reduced by about 1,470 feet or about 1.2 percent. The flow characteristics of the affected portion of Segment 4 would periodically be modified, resulting in slower moving waters and a wider river channel. When inundated, the affected portion would retain some current, but flow velocities would decrease with distance downstream. This modification would not meet the definition of a free-flowing river under the Federal WSRA.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 1,470-foot reach of Segment 4 that would be affected by CP1 would become ineligible for listing under the Federal WSRA.

Water Quality As Shasta Lake's water levels rise, vegetation and soils along the banks of the affected portion of Segment 4 would become inundated. Most or all of the vegetation that is inundated would eventually die and be washed or fall into the river, bringing with it sediment and other materials that could affect water quality. Soils in the affected portion of Segment 4 would erode as water levels rise and fall, causing an increase in turbidity. These effects would likely be most noticeable during the initial inundation periods, since the river corridor is likely to eventually stabilize as the soil is eroded to bedrock.

Within the approximately 1,470-foot reach of Segment 4 that would be affected under CP1, water temperatures would fluctuate relative to temperatures immediately upstream. Similar to flow, these changes would vary by water year type. Increased turbidity and warmer water temperatures would be most noticeable along the affected portion of Segment 4 because this area has not been previously exposed to periodic inundations.

Adverse effects on water quality would be associated with the periodic fluctuations in the water levels of Shasta Lake. Because water quality is a fundamental requirement for wild and scenic river eligibility, the 1,470-foot reach of Segment 4 that would be affected by CP1 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Under CP1, erosion of rock outcrops and expansion of the bathtub ring in an approximately 1,470-foot reach of Segment 4 could expose buried or previously undiscovered prehistoric cultural resources associated with Wintu occupation of the area and historic recreational uses of the area. As this reach becomes inundated, any exposed resources would be susceptible to the effects of water, which could damage or otherwise alter their values, affecting their eligibility for listing on the National Register of Historic Places and reducing their importance for providing information on past use within the corridor. As the water recedes, exposed resources would be susceptible to wind and rain and could be visible, potentially exposing them to theft or vandalism. These adverse effects would be localized along the corridor of the affected portion of Segment 4 and would likely only affect a small portion of the cultural resources that may be associated with the lower McCloud River basin.

The historic structures associated with the Bollibokka Club occur outside of the area that would be affected by the expanded transition reach and would not be affected. However, unrecorded resources associated with the Wintu village locations may occur within the corridor along the river and could be subjected to periodic inundation, deposition, and scour within the upper portions of the

expanded transition reach. Portions of three other recorded sites could also be subject to similar impacts within the expanded transition reach, which could result in damage to resources within the sites. Although these sites may provide information on the area's history or prehistory, none of these sites has been evaluated for listing on the National Register of Historic Places.

Sacred sites important to Native Americans have not been specifically identified, and access to lands adjacent to the reach that would be periodically inundated under CP1 is limited because all of these lands are privately owned.

The cultural resources located along the 1,470-foot reach of Segment 4 that would be affected under CP1 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the 1,470-foot extension of the transition reach would be affected during periodic inundations, resulting in potential adverse effects on the fish that occur in the river. Potential adverse effects on fish could include a reduction in spawning habitat for trout in the expanded transition reach and an increase in the range of warmwater fish in the lower McCloud River. Fishing opportunities would not be affected more than they are now with the periodic fluctuations in river levels.

Under CP1, the transition reach would be extended by about 1,470 feet to the 1,078-foot elevation, resulting in a larger inundation area when Shasta Lake water levels are the highest. Aquatic habitat in the affected portion of Segment 4 consists primarily of flatwater habitat (52 percent glide, 19 percent mid-channel pool, and 13 percent run), with pocket water (11 percent) and a small, low-gradient riffle (5 percent) in the lower portion of the segment. With the periodic inundations, sediment deposition could cause flatwater habitat to convert to riffle habitat, resulting in a reduction in flatwater habitat of less than 3 percent of the total lower McCloud River's flatwater habitat. During the inundation period, riffle and pool habitat (approximately 1.2 percent of the total lower McCloud River) would be converted to flatwater habitat. Also, riparian vegetation along the newly inundated banks of the affected portion of Segment 4 would be expected to die, which could affect water temperatures and reduce cover for fish in this reach. The extent of these effects would depend on the frequency, duration, and surface elevation of the inundation, which would vary depending on the type of water year and water levels of Shasta Lake.

The migration of fish, especially trout, between the lower McCloud River and Shasta Lake is an important attribute of the unique trout fishery. Many of the rainbow and brown trout that occupy the lower McCloud River spend part of their lives rearing in Shasta Lake, feeding on the abundant prey in the lake and attaining large sizes that would not be possible if they reared only in the river. Upon returning to the river to spawn, these lake-reared fish provide the trophy-sized trout, particularly brown trout, for which the lower McCloud River is renowned (Rode and Dean 2004). Based on a survey that extended up to Tuna

Falls (North State Resources, Inc. 2008), the reach of Segment 4 that would periodically be inundated does not contain any barriers or impediments to fish movement or migration, and CP1 would not create any. Consequently, trout migration through the transition reach to upstream spawning areas would not be impaired.

Conversely, warmwater fish movement between the lake and river is not likely to be facilitated by the expanded transition reach. Warmwater fish from Shasta Lake, such as spotted bass, have been observed throughout the lower McCloud River, at least up to the confluence with Tuna Creek (North State Resources, Inc. 2008). Nonnative warmwater species inhabiting Shasta Lake (e.g., smallmouth bass and spotted bass) are known to exploit riverine and transitional habitats and are effective predators of juvenile trout. No barriers have been observed in the transition reach that could prevent warmwater fish from moving upstream, and no barriers would be created by the expansion of the transition reach. Warmwater fish would continue to be able to move between the lake, the transition reach, and lower McCloud River (Segment 4).

Aquatic habitat changes could affect how fluvial resident trout use habitat within the affected portion of Segment 4. General effects may range from temporary displacement of trout to upstream habitats at high water levels to degraded riverine habitat suitability within the transition reach.

Suitable spawning habitat for rainbow and brown trout in the expanded transition reach is limited because of the few pools and riffles available during the spring and fall when these species spawn. Based on the USFS habitat data and more recent reconnaissance surveys, the amount of spawning gravels in the expanded transition reach represents only a small percentage of the suitable spawning habitat in the lower McCloud River. However, any effect on spawning habitat would be considered adverse.

Geology During periods of maximum inundation in the 1,470-foot portion of Segment 4 that would be affected under CP1, some rock outcrops may become inundated and could erode, but the overall geologic value of the McCloud Limestone features would not be adversely affected.

Visual Quality/Scenery The visual quality of the affected portion of Segment 4 would decrease as the vegetation along the banks becomes inundated and eventually dies, the bathtub ring expands, and evidence of flow is reduced. These conditions would be similar to those in the current transition reach. The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP1 would result in making approximately 1,470 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation

measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP1): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 1,470 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. Although raising Shasta Dam would result in inundation of part of Segment 4, the McCloud River and the adjoining lands in this part of the segment are not National Forest System lands and therefore not subject to the LRMP. Management of the river's ORVs under the STNF LRMP and the CRMP would not be affected. No land use changes would occur along the river, and the USFS and signatories to the CRMP would be able to continue implementing provisions of their plans that apply to the river. Because the LRMP does not apply to the private lands in Segment 4, there would be no impact and no mitigation is required.

Impact WASR-3 (CP1): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The State PRC includes provisions that protect the wild trout fishery of the lower McCloud River. Under CP1, this equates to about 1,470 feet of the river that would be modified and function as an additional portion of the existing transition reach. This reach of the river provides limiting spawning habitat for wild trout (NSR 2009) and during runoff conditions is subject to sedimentation and erosion of the bed and banks similar to upstream reaches. Public access to utilize the fishery offered in this reach is limited to the area below the high-water mark (State Lands) and lands managed by the STNF similar to the other portions of Segment 10 upstream of the McCloud River Bridge. Implementation of proposed modifications to Shasta Dam and Shasta Lake could affect the wild trout fishery (access and ecology) of the lower McCloud River identified in the State PRC. This impact would be potentially significant.

The proposed modifications to Shasta Dam and Shasta Lake would result in periodic fluctuations in water levels within the expanded transition reach, permanently affecting about 1.2 percent of the lower McCloud River and its associated fishery habitat. Under CP1, the transition reach would be extended by about 1,470 feet, a 16 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to that described under Impact WASR-1 and Impact WASR-2 and comparable to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the fishery (populations and habitat) are small in the context of the entire lower McCloud River. This impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP1): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The State PRC includes provisions that protect the free-flowing conditions of the McCloud River, including the conditions in the transition reach upstream of the McCloud River Bridge. Implementation of proposed modifications to Shasta Dam and Shasta Lake could affect the free-flowing conditions of the McCloud River, as identified in the State PRC. This impact would be significant.

The proposed modifications to Shasta Dam and Shasta Lake would result in periodic fluctuations in water levels within the expanded transition reach, permanently affecting about 1.2 percent of the lower McCloud River. Under CP1, the transition reach would be extended by about 1,470 feet, a 16 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the river would not be adversely affected beyond the upstream extension of the transition reach. The primary impact of the expansion of the transition reach would be modifications to the free-flowing character in a manner similar to that described under Impact WASR-1 and Impact WASR-2. While the overall impacts to the free-flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (1.2 percent), this impact would be significant and unavoidable. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

CP2 – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

CP2 would involve a 12.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 14.5 feet and enlarge the total storage space in the lake by 443,000 acre-feet. This increase would equate to an increase of about 1,850 acres of surface area when the lake is full. CP2 also includes measures to increase water supply reliability while contributing to increased survival of anadromous fish. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 120,000 acre-feet and 60,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP2 would help reduce future water shortages through increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River.

Impact WASR-1 (CP2): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Impact WASR-1 (CP2) would be similar to Impact WASR-1 but would affect 1,270 feet more of Segment 4 than CP1.

Implementation of CP2 would reduce the total length of the McCloud River that is eligible for wild and scenic river designation by about 2,740 feet (approximately 2.3 percent of the total length of the lower river). The rest of the lower McCloud River would remain eligible for listing.

Under CP2, approximately 2,740 feet, or 21 percent, of Segment 4 would be periodically inundated. The transition reach would increase to a maximum elevation of 1,084 feet msl, which would extend it by about 2,740 feet (a 30 percent increase over the current transition reach), inundating a larger portion of the lower McCloud River within the study area and Segment 4. The inundated area would increase to approximately 51 total acres (an increase of 18 acres over existing conditions and 9 acres more than CP1 conditions), with a maximum width of approximately 530 feet (an increase of 60 feet over existing conditions) and a total length of approximately 11,740 linear feet (2.22 miles). The extension of the transition reach by approximately 2,740 feet would affect approximately 21 percent of Segment 4. Additional impacts under CP2 compared with CP1 would be minimal and would be limited to the additional 440-foot extension of the transition reach and about 15 additional feet on both sides of the river.

During a wet year, the maximum average water surface elevation of Shasta Lake would be 1,080 feet msl, with a peak elevation of 1,084 feet msl during May. This is an increase of 15 feet above the existing maximum average. During an average water year, the maximum average water surface elevation would increase to 1,051 feet msl, an increase of 11 feet above existing conditions. During dry and critical water years, the change would be on the order of 5 to 9 feet in elevation.

The increased gross pool of Shasta Lake would expand the current transition reach up to the 1,084-foot elevation, a 30 percent increase. Flow conditions and fisheries in the 2,740-foot reach of Segment 4 would periodically be affected, with the timing and duration of the effects similar to those in the current transition reach. Over time, the expansion of the bathtub ring would adversely affect water quality, geology, and visual quality/scenery. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans.

Free-Flowing Conditions As discussed under Impact WASR-1 (CP1), the flow characteristics of the extended transition reach under CP2 would be periodically modified, resulting in slower moving waters and a wider river channel. This modification would not meet the definition of a free-flowing river under the Federal WSRA. The width of the transition reach would be increased by approximately 30 feet on both sides of the river. Flow conditions and the river's free-flowing nature upstream from the expanded transition reach would remain similar to current conditions.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 2,740-foot reach of Segment 4 that would be affected by CP2 would become ineligible for listing under the Federal WSRA.

Water Quality Under CP2, increased turbidity and warmer water temperatures would be most noticeable along the expanded 2,740 feet of the transition reach and in the 30-foot corridor on either side of the transition reach because these areas have not been previously exposed to periodic inundations. As discussed under Impact WASR-1 (CP1), effects on water quality would be associated with the periodic increases in water levels of Shasta Lake.

Because water quality is a fundamental requirement for wild and scenic river eligibility, the 2,740-foot reach of Segment 4 that would be affected by CP2 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Impacts would be the same as discussed under Impact WASR-1 (CP1); however, a slightly larger portion of the three recorded sites and possible resources associated with the known Wintu villages would be inundated.

The cultural resources located along the 2,740-foot reach of Segment 4 that would be affected under CP2 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the affected 2,740-foot segment consists of pocket water and a lateral scour pool. The potential conversion of flatwater habitat to riffle habitat in the 2,740-foot segment would be similar to but greater than under WASR-1 (CP1), and overall impacts to aquatic habitat and fish would be similar to those discussed under Impact WASR-1 (CP1).

Geology Impacts would be the same as discussed under Impact WASR-1 (CP1); the geologic values of the lower McCloud River would not be adversely affected.

Visual Quality/Scenery Impacts would be the same as discussed under Impact WASR-1 (CP1). The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP2 would result in making approximately 2,740 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP2): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 2,740 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. There would be no impact, and no mitigation is required.

Impact WASR-3 (CP2): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-3 (CP1) but the magnitude of the impact would be greater under CP2 because of the longer transition reach. Under CP2, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 2.3 percent of the lower McCloud River. Under CP2, the reach affected by Shasta Lake water levels would be extended by about 2,740 feet, a 30 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. An impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the wild trout fishery, including public access and management opportunities in conjunction with fish habitat and populations, are small in the context of the entire lower McCloud River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP2): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-4 (CP1) but the magnitude of the impact would be greater under CP2 because of the longer transition reach. Under CP2, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 2.3 percent of the lower McCloud River. Under CP2, the reach affected by Shasta Lake water levels would be extended by about 2,740 feet, a 30 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the lower McCloud River would not be adversely affected beyond the upstream extension of the transition reach. While the overall impacts to the free-flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (2.3 percent), the impacts would be significant. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted

by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

CP3, CP4, CP4A, and CP5 – 18.5-Foot Dam Raise, with Variations

CP3, CP4, CP4A, and CP5 would involve an 18.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 20.5 feet and enlarge the total storage space in the lake by 634,000 acre-feet. This increase would equate to an increase of about 2,500 acres of surface area when the lake is full. CP3 focuses on increasing agricultural water supply reliability and increasing anadromous fish survival CP4, CP4A, and CP5 increase water supply reliability and include enhancements in the upper Sacramento River for anadromous fish survival including gravel augmentation and the restoration of riparian, floodplain, and side channel habitat.

CP3 would increase the ability of Shasta Dam to make cold-water releases and regulate water temperatures for fish in the upper Sacramento River, primarily in dry and critical water years. CP3 would help reduce estimated future water shortages by increasing the reliability of dry and critical year water supplies for agricultural deliveries by at least 63,000 acre-feet per year and average annual deliveries by about 62,000 acre-feet per year. Under CP3, operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, with the additional storage retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries.

CP4 would be used to improve the ability to meet temperature objectives and habitat requirements for anadromous fish during drought years and increase water supply reliability. Of the increased reservoir storage space under CP4, about 378,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4, operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as in CP1, with 70,000 acre-feet and 35,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4 includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River.

CP4A reserves a portion of the increased storage in Shasta Lake for maintaining cold-water volume or augmenting flows in the Sacramento River as part of an adaptive management plan for anadromous fish survival. Of the increased reservoir storage space under CP4A, about 191,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2, with 120,000 acre-feet reserved in dry years and 60,000 acre-feet reserved in critical years for M&I deliveries. CP4A includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River. CP5 would help reduce future water shortages through increasing drought year

and average year water supply reliability for agricultural and M&I deliveries. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 150,000 acre-feet and 75,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP5 also includes constructing additional fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries; augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake.

Impacts associated with CP3, CP4, CP4A, and CP5 would be very similar to those described for CP1 and CP2, but the increased water levels of Shasta Lake would affect a longer reach of the lower McCloud River. Because of their similarities, and in an effort to reduce redundancy, only the differences between the plans are described below.

Impact WASR-1 (CP3, CP4, CP4A, and CP5): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Implementation of CP3, CP4, CP4A, and CP5 would reduce the total length of the McCloud River that is eligible for wild and scenic river designation by about 3,550 feet (less than 3 percent of the total length of the lower river). The rest of the lower McCloud River would remain eligible for listing.

Under CP3, CP4, CP4A, and CP5, the extent of the transition reach would increase to a maximum elevation of 1,090 feet msl, which would extend the current transition reach by about 3,550 feet (a 39 percent increase over the current transition reach), inundating a larger portion of the lower McCloud River within the study area and Segment 4. The inundated area would increase to approximately 60 total acres (an increase of 27 acres over existing conditions, and 9 acres more than CP2 conditions), with a maximum width of approximately 610 feet (an increase of 140 feet over existing conditions) and a total length of approximately 12,550 linear feet (2.38 miles). The extension of the transition reach by approximately 3,550 feet would affect approximately 26 percent of Segment 4. Additional impacts under CP3, CP4, CP4A, and CP5 compared with CP1 and CP2 would be minimal and would be limited to the additional 810-foot extension of the transition reach and about 20 additional feet on either side of the river.

During a wet year, the maximum average water surface elevation of Shasta Lake would be 1,086 feet msl, with a peak elevation of 1,090 feet msl during May. This is an increase of 21 feet above the existing maximum average. During an average water year, the maximum average water surface elevation would increase to 1,054 feet msl, an increase of 14 feet above existing conditions. During dry and critical water years, the change would be on the order of 6 to 13 feet in elevation.

The increased gross pool of Shasta Lake would expand the current transition reach by approximately 3,550 feet (810 feet beyond CP2's effects) up to the 1,090-foot elevation, resulting in a 39 percent increase in the transition reach. Within the expanded transition reach, flow conditions and fisheries would periodically be affected, with the timing and duration of the effects similar to those in the current transition reach. Over time, the expansion of the bathtub ring would affect water quality, geology, and visual quality/scenery. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans.

Free-Flowing Conditions As discussed under Impact WASR-1 (CP1), the flow characteristics of the extended transition reach under CP3, CP4, CP4A, and CP5 would be temporarily modified, resulting in slower moving waters and a wider river channel. This modification would not meet the definition of a free-flowing river under the Federal WSRA. The width of the transition reach would be increased by approximately 70 feet on either side of the river. Flow conditions and the river's free-flowing nature upstream from the expanded transition reach would remain similar to current conditions.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 3,550-foot reach of Segment 4 that would be affected by CP3, CP4, CP4A, and CP5 would become ineligible for listing under the Federal WSRA.

Water Quality Under CP3, CP4, CP4A, and CP5, increased turbidity and warmer water temperatures would be most noticeable along the expanded 3,550-foot reach of the transition reach and in the 70-foot corridor on either side of the transition reach because these areas have not been previously exposed to periodic inundations. Under these plans, the wider affected river corridor could result in greater temporary effects on water quality because more vegetation would be temporarily inundated and more soils would be exposed. As discussed under Impact WASR-1 (CP1), effects on water quality would be associated with the periodic increases in water levels of Shasta Lake.

Because water quality is a fundamental requirement for wild and scenic river eligibility, the 3,550-foot reach of Segment 4 that would be affected by CP3, CP4, CP4A, and CP5 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Impacts would be similar to those discussed under Impact WASR-1 (CP1). Under CP3, CP4, CP4A, and CP5, the

wider affected river corridor could result in greater effects on cultural resources because of the wider inundated area and increased erosion. Larger portions of the three recorded sites and known Wintu villages would become inundated.

The cultural resources located along the 3,550-foot reach of Segment 4 that would be affected under CP3, CP4, CP4A, and CP5 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the additional 810-foot segment under CP3, CP4, CP4A, and CP5 consists of a mid-channel pool and a lateral scour pool. The potential conversion of flatwater habitat to riffle habitat in the 3,550-foot reach of Segment 4 that would be affected under these plans would be similar to but greater than under WASR-1 (CP1), and overall impacts to aquatic habitat and fish would be similar to those discussed under Impact WASR-1 (CP1).

Geology Impacts would be the same as discussed under Impact WASR-1 (CP1), except additional rock outcrops could become inundated because of the wider affected corridor.

Visual Quality/Scenery Impacts would be similar to those discussed under Impact WASR-1 (CP1). Under these plans, the wider affected river corridor could result in greater effects on the visual setting because of the wider inundated area and increased impacts on vegetation. The water line would also be visible at a higher elevation and could be more noticeable. The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP3, CP4, CP4A, and CP5 would result in making approximately 3,550 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP3, CP4, CP4A, and CP5): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 3,550 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. There would be no impact, and no mitigation is required.

Impact WASR-3 (CP3, CP4, CP4A, and CP5): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-3 (CP1), but the magnitude of the impact would be greater under CP3, CP4, CP4A, and CP5 because of the longer transition reach. Under CP3, CP4, CP4A, and CP5, the proposed modifications to Shasta Dam and Shasta Lake would result in

temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 3 percent of the lower McCloud River. Under CP3, CP4, CP4A, and CP5, the reach affected by Shasta Lake water levels would be extended by about 3,550 feet, a 39 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the wild trout fishery including public access and management opportunities in conjunction with fish habitat and populations are small in the context of the entire lower McCloud River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP3, CP4, CP4A, and CP5): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-4 (CP1), but the magnitude of the impact would be greater under CP3, CP4, CP4A, and CP5 because of the longer transition reach. Under CP3, CP4, CP4A, and CP5, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 3 percent of the lower McCloud River. Under CP3, CP4, CP4A, and CP5, the reach affected by Shasta Lake water levels would be extended by about 3,550 feet, a 39 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the river would not be adversely affected beyond the upstream extension of the transition reach. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the free flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (3 percent), the impacts would conflict with the State PRC. This impact would be significant. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

25.4.4 Mitigation Measures

Table 25-2 presents a summary of mitigation measures for wild and scenic rivers.

The mitigation measures described in the following section were developed partly in response to comments on the DEIS. While these measures are considered to be potentially feasible and effective in their ability to reduce impacts, this EIS acknowledges that there is uncertainty with respect to reducing impacts to less-than-significant levels.

Table 25-2. Summary of Mitigation Measures for Wild and Scenic Rivers

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact WASR-1: McCloud River's Eligibility for Listing as a Federal Wild and Scenic River	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	No feasible mitigation available to reduce impact at this point in the planning process.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact WASR-2: Conflict with Shasta-Trinity National Forest, Land and Resource Management Plan	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None required.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact WASR-3: Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Fishery Protection, Restoration and Improvement Program for the Lower McCloud River Watershed.				
	LOS after Mitigation	NI	PS	PS	PS	PS	PS
Impact WASR-4: Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure WASR-4 (CP1-CP5): Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Key:
CP = Comprehensive Plan
LOS = level of significance
NI = no impact
PS = potentially significant
S = significant
SU = significant and unavoidable

No-Action Alternative

Under the No-Action Alternative, no action would be taken, including implementation of mitigation measures; rather, existing conditions would continue to change in response to natural processes and human activities. No mitigation measures are required for the No-Action Alternative.

Mitigation Measure WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Wild Trout Fishery Protection, Restoration and Improvement Program Within the Lower McCloud River Watershed

The inundation of a portion of the lower McCloud River will affect the habitat available to wild trout and other aquatic organisms. The impacts are similar to, but more specific to the lower McCloud River watershed than those described under Impact Geo-2 in Chapter 4, "Geology, Geomorphology, Minerals and Soils"; Impact WQ-1 in Chapter 7, "Water Quality"; and Impacts Aqua-4 and Aqua-7 in Chapter 11, "Fisheries and Aquatic Ecosystems." This mitigation measure incorporates Mitigation Measures Geo-2, WQ-1, and Aqua-4.

This mitigation measure also includes the commitment to identify suitable sections of the lower McCloud River protected under the State PRC that may be available for acquisition from willing sellers for purposes of protecting, restoring and improving the wild trout fishery. This element of the mitigation measures is intended to be consistent with CDFW's wild trout policy as defined in the Strategic Plan for Trout Management, Appendix E, Section C (CDFG 2003), emphasizing designation and management of the wild trout fishery available to the public.

Watershed analysis and assessments prepared for the lower McCloud River watershed document that roads and modified fire regimes have increased sediment contributions to receiving waters, particularly in those watersheds that have been subjected to mining, forest management, and other types of large-scale developments and disturbances (CVWRCB 2011). Reclamation will apply this element of this mitigation measure to protect, restore, and improve the wild trout fishery in the lower McCloud River watershed.

The STNF, through the efforts of the interagency mitigation working group described in Chapter 2, "Action Alternatives," identified that acquisition of lands along the lower McCloud River is a priority and is consistent with the LRMP to meet a number of resource goals and objectives (e.g., cultural resources, recreation, biological resources). Under Impacts WASR-3 and WASR-4, the wild trout fishery and free-flowing conditions in the main stem lower McCloud River that would be affected in the protected reach would be at most 3,550 feet. This element of Mitigation Measure WASR-3 would include acquisition of private lands along the river corridor commensurate with the selected action alternative, if authorized, and available from a willing seller.

This mitigation measure requires that Reclamation work with the watershed stakeholders (e.g., CRMP members) to develop a basin plan that identifies deficient areas where riparian and watershed improvements can be made and work with landowners to improve those areas. Reclamation will commit to funding the planning effort, which will be completed within 10 years after construction has been initiated. This plan is intended to reduce the impacts of inundation on the wild trout fishery in the McCloud River and its tributaries. This program would be performed in conjunction with the efforts of the interagency work group described in Mitigation Measure Geo-2.

Although implementation of this mitigation measure will reduce the impacts associated with WASR-3, Reclamation acknowledges that the impact would remain potentially significant.

Mitigation Measure WASR-4 (CP1-CP5): Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed The inundation of a portion of the lower McCloud River will impede the free-flowing nature of as much as 3,550 feet of the river, thereby affecting the hydrologic and hydraulic

characteristics of the affected reach. These impacts are similar to other inundated tributaries, but more specific to the lower McCloud River. These impacts are described in Chapter 4, "Geology, Geomorphology, Minerals and Soils" (Impact Geo-2); Chapter 7, "Water Quality" (Impact WQ-1); and Chapter 11, "Fisheries and Aquatic Ecosystems" (Impacts Aqua-4 and Aqua-7). This mitigation measure incorporates Mitigation Measures Geo-2, WQ-1, and Aqua-4, specifically in the context of increasing the overall hydrologic function of the lower McCloud River watershed in a variety of ways. Examples of the measures that may be implemented include the following:

- Silviculture treatments that improve fuel conditions, reduce runoff from high intensity fires and enhance the functions and values of wetlands and riparian areas

- Road decommissioning and drainage improvement projects that reduce concentrated road-related runoff and reestablish flows to tributaries to the lower McCloud River

- Restoration/improvement of in-channel habitat to enhance potential for sustained flows from tributaries

This measure also includes the mitigation measures described in Chapter 12, "Botanical Resources and Wetlands," intended to support land acquisition and wetland mitigation. Five mitigation measures would be applicable to WASR-4: Bot-2, Bot-3, Bot-4, Bot-5 and Bot-7. Land acquisition and wetland mitigation measures are intended to offer a certain level of protection from future development (e.g., diversions) as well as opportunities to improve the hydrologic function at multiple scales that could provide an overall benefit to the free-flowing conditions of the lower McCloud River.

Although implementation of this mitigation measure will reduce the impacts associated with WASR-4, Reclamation acknowledges that the impact would remain significant and unavoidable.

25.4.5 Topics Eliminated from Further Consideration

No topics related to the eligibility of the McCloud River for listing under the Federal WSRA, the compatibility of the alternatives with the STNF LRMP or the CRMP, or their compatibility with the PRC providing protection to the McCloud River were eliminated from further consideration.

25.4.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the

projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have impacts on the McCloud River in the primary study area and the SLWRI would not have adverse impacts in the extended study area; therefore, the following analysis is based on programs and projects listed in Table 3-1 under Qualitative Analysis that would have potential effects in the primary study area as explained below.

Significant effects were identified related to the compatibility of the project with the PRC, Section 5093.542. The potential effects would be of greater magnitude and duration with the larger dam raises (i.e., CP3 through CP5 would have greater potential effects than CP1 and CP2). These impacts may also be associated with two reasonably foreseeable future actions that could affect the McCloud River: the relicensing of PG&E's McCloud-Pit Project and the pilot project to reintroduce anadromous salmonid populations upstream from Shasta Dam. FERC has issued the Final EIS for the relicensing of the McCloud-Pit Project. However, the relicensing process for the McCloud-Pit Project is ongoing, and the conditions that may be required under a new FERC license are uncertain. The potential effects of the relicensing on the lower McCloud River are therefore unknown.

In 2012, the Bagley Fire and subsequent winter flood events resulted in significant changes to vegetation conditions, erosional processes, and water quality in the lower McCloud River watershed. The impacts of this combination of natural disturbances are ongoing and there is considerable uncertainty on how they are affecting the physical processes and biological resources of the lower McCloud River watershed. Subsequent management activities (e.g., road reconstruction, silviculture) are ongoing throughout the Bagley Fire area.

The 2009 NMFS Biological Opinion described in Chapter 3 requires Reclamation to implement a pilot project that would provide passage for anadromous salmonids upstream from Shasta Dam. This project is listed in Table 3-1 as the Fish Passage Program at Shasta. This project could reintroduce anadromous salmonids to the lower McCloud River. At this point in the planning process, the details of this project are ill-defined and the potential for success is uncertain. Therefore, the potential effects of this future action on the lower McCloud River are unknown. Given the information available on these future actions, the potential for project-related impacts to be cumulatively considerable would be less than significant and could, in fact, result in benefits to some of the values and resources of the lower McCloud River.