# Chapter 7
# Water Quality

## 7.1 Affected Environment

This section describes the affected environment related to water quality for the dam and reservoir modifications proposed under the SLWRI. For more detail, please see the *Water Quality Technical Report*.

### 7.1.1 Overview of Water Quality Conditions

Surface water quality in the study area is affected by natural runoff, agricultural return flows, abandoned mines, construction, logging, grazing, operations of flow-regulating facilities, urbanization, and recreation. This section discusses key water quality constituents of concern (temperature, sediments, and metals), the factors influencing their concentrations, and the regulatory objectives associated with maintaining beneficial uses.

The following discussion provides an overview of water quality and its relationship to beneficial uses throughout the primary and secondary study areas. This section is followed by discussions of key water quality parameters that influence beneficial uses to varying degrees within the study areas; temperature, sediment and metals.

#### *Shasta Lake and Vicinity*

This section addresses water quality in the Shasta Lake and vicinity portion of the primary study area. It focuses on the six arms of Shasta Lake and tributaries that enter into Shasta Lake from the surrounding watersheds.

Water quality in this portion of the primary study area generally meets the standards for beneficial uses identified in the *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins* (Basin Plan) (CVRWQCB 2009). The quality of surface waters in Shasta County is generally considered good, although some water bodies are affected by nonpoint pollution sources that influence surface water quality: high turbidity from controllable sediment discharge sources (e.g., land development and roads); high concentrations of nitrates and dissolved solids from range and agricultural runoff or septic tank failures; contaminated street and lawn runoff from urban areas, roads, and railroads; acid mine drainage and heavy metal discharges from historic mining and processing operations; and warm-water discharges into cold-water streams.

The quality of water in underground basins and water-bearing soils is also considered generally good throughout most of Shasta County. Potential hazards to groundwater quality involve nitrates and dissolved solids from agricultural and range practices and septic tank failures. The ability of soils in Shasta County to support septic tanks and on-site wastewater treatment systems is generally severely limited, particularly on older valley terrace soils and certain loosely confined volcanic soils in the eastern portions of the county (CVRWQCB 2009).

The surface water quality of streams and lakes draining the Shasta-Trinity National Forest (STNF) and adjacent private lands generally meets standards for beneficial uses defined by the Basin Plan (CVRWQCB 2009). There are, however, some areas where the water quality does not meet the standards during periods of storm runoff because of past management activities, or as a result of drainage from historic mining and processing operations. The cumulative impacts of successive activities, such as road construction and timber harvesting on private and National Forest lands, also contribute to the degradation of water quality in the STNF (USFS 1995). Within this portion of the primary study area, most of the road construction and timber harvest activities occur on private lands.

Shasta Dam and Shasta Lake constitute the “keystone of the Central Valley Project.” Approximately 6.2 million acre-feet of water flows annually into Shasta Lake from the Sacramento River, McCloud River, and Pit River drainages. A favorable inflow-outflow relationship of 1.4 to 1 results in good water quality, both in the lake and downstream (USFS 1996), although Shasta Lake is considered an impaired water body due to heavy metal accumulations (e.g., cadmium, copper and zinc) at locations throughout the reservoir (CVRWQCB 2009).

Nutrient inputs and bacteria are not of concern in the Sacramento River and McCloud River arms (USFS 1998); however, they could be an issue in the Pit River Arm as a result of runoff from agricultural and range lands in the upper Pit River watershed. Within Little Backbone Creek, Dry Creek, and the Squaw Creek Arm, the waters are locally limited by low pH and elevated concentrations of heavy metals caused by drainage from abandoned mines (CVRWQCB 2003a). In addition, data suggest that sediment and turbidity locally affect beneficial uses, mainly contact recreation. A recent 2-year study conducted by the State Water Resources Control Board (SWRCB) sampled mercury accumulations in fish at a number of locations throughout Shasta Lake. This study documented elevated levels of mercury in some specimens (Davis et al. 2010).

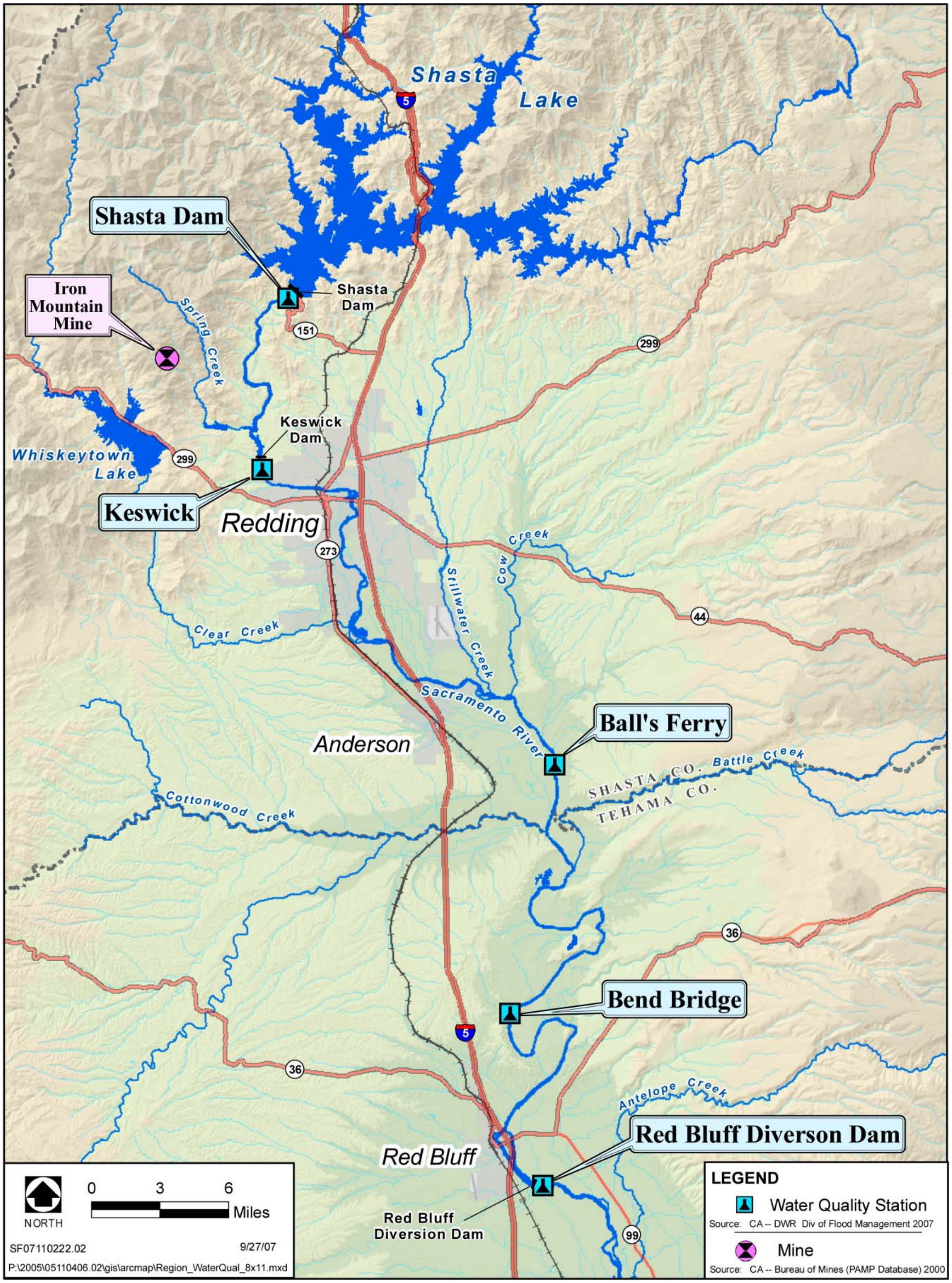



**Figure 7-1. Upper Sacramento River Primary Study Area**

***Upper Sacramento River (Shasta Dam to Red Bluff)***

Tributaries to the Upper Sacramento River, and place names referred to in the text are shown in Figure 7-1. The main sources of water in the Sacramento River below Keswick Dam are rain and snowmelt that collect in upstream reservoirs and are released in response to water needs or flood control. The quality of surface water downstream from Keswick Dam is also influenced by other human activities along the Sacramento River downstream from the dam, including agricultural, historical mining, and municipal and industrial (M&I) inputs.

The quality of water in the Sacramento River is relatively good. Only during conditions of stormwater-driven runoff are water quality objectives typically not met (Domagalski et al. 2000). Water quality issues within the primary study area of the Sacramento River include the presence of mercury, pesticides such as organochlorine pesticides, trace metals, turbidity, and toxicity from unknown origin (CALFED 2000a).

Water quality in the Sacramento River and its major tributaries above Red Bluff Diversion Dam (RBDD) is generally good (Table 7-1). Nutrients such as nitrate were found to be low throughout the Sacramento River basin (Domagalski and Dileanis 2000, as cited in Domagalski et al. 2000). Water temperature is a principal water quality issue in the upper Sacramento River between Keswick Dam and RBDD.

**Table 7-1. Summary of Conventional Water Quality Constituents Collected in the Sacramento River at Red Bluff from 1996 to 1998**

| Constituent (unit) | Water Quality Objective | Average Measurement |
|---|---|---|
| **Conventional Physical and Chemical Constituents** | | |
| Temperature | < 2.5ºF [a] | 52.7ºF |
| Conductivity (µS/cm) | – | 116 |
| Dissolved Oxygen (mg/L) | 7.0 [b] | 10.7 |
| Dissolved Oxygen Saturation (%) | 85 [b] | 99 |
| pH (standard unit) | 6.5 to 8.5 [c] | 7.8 |
| Alkalinity (mg/L $CaCO_3$) | – | 48.3 |
| Total Hardness (mg/L $CaCO_3$) | – | 46.6 |
| Suspended Sediment (mg/L) | – | 38.8 |
| Calcium (mg/L) | narrative [d] | 10.3 |
| Magnesium (mg/L) | – | 5.0 |
| Sodium (mg/L) | – | 5.8 |
| Potassium (mg/L) | – | 1.1 |
| Chloride (mg/L) | 500 [e] | 2.4 |

**Table 7-1. Summary of Conventional Water Quality Constituents Collected in the Sacramento River at Red Bluff from 1996 to 1998 (contd.)**

| Constituent (unit) | Water Quality Objective | Average Measurement |
|---|---|---|
| **Conventional Physical and Chemical Constituents** | | |
| Sulfate (mg/L) | 500 [e] | 4.5 |
| Silica (mg/L) | – | 20.5 |
| $NO_2 + NO_3$ (mg/L N) | $NO_3 < 10$ [f] | 0.12 |
| Total Phosphorus (mg/L P) | – | 0.0477 |
| **Trace Metals** | | |
| Arsenic (µg/L) | 50 [g] | 1.0 |
| Chromium (µg/L) | 180 [g] | 1.0 |
| Copper (µg/L) | 5.1 [g] | 1.6 |
| Mercury (µg/L) | 0.050 [g] | 0.0045 |
| Nickel (µg/L) | 52 [g] | 1.2 |
| Zinc (µg/L) | 120 [g] | 2.3 |
| **Organic Pesticides** | | |
| Molinate (ng/L) | 13,000 [h] | < 60 |
| Simazine (ng/L) | 3,400 [i] | < 22 |
| Carbofuran (mg/L) | 40,000 [e], 500 [i] | < 31 |
| Diazinon (mg/L) | 51 [j] | < 28 |
| Carbaryl (ng/L) | 700 [k] | < 41 |
| Thiobencarb (ng/L) | 1,000 [a] | < 38 |
| Chlorpyrifos (ng/L) | 14 [j] | < 25 |
| Methidathion (ng/L) | – | < 38 |

*Source: CBDA 2005*

Notes:
[a] The Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins (Basin Plan) water quality objective for allowable change from controllable factors.
[b] Basin Plan water quality objective.
[c] Basin Plan water quality objective; < 0.5 allowable change from controllable factors.
[d] Basin Plan narrative objective: Water shall not contain constituent in concentrations that would cause nuisance or adversely affect beneficial uses.
[e] Secondary drinking water maximum contaminant level (MCL).
[f] Primary drinking water MCL.
[g] California Toxics Rule (CTR) aquatic life criteria for 4-day average dissolved concentration.
[h] CTR human health maximum criteria total recoverable concentration.
[i] California Department of Fish and Game hazard assessment value.
[j] DFG aquatic life guidance value for 4-day average concentration.
[k] U.S. Environmental Protection Agency Integrated Risk Information System reference dose for drinking water quality.

Key:
– = not applicable
µg/L = micrograms per liter
µS/cm = microSiemens per centimeter
$CaCO_3$ = calcium carbonate
mg/L = milligrams per liter
N = nitrogen
ng/L = nanograms per liter
$NO_2$ = nitrate
$NO_3$ = nitrite
ºF = degrees Fahrenheit
P = phosphorus

Although all trace metals shown in Table 7-1 were well below their established water quality objectives, one of the principal water quality issues in the upper

Sacramento River portion of the primary study area is acid mine drainage and associated heavy-metal contamination from the Spring Creek drainage and other abandoned mining sites. It should be noted that the U.S. Geological Survey (USGS) study detected mercury, but it did not exceed the criterion of ambient level specified in the California Toxics Rule; however, California Toxics Rule levels for mercury are not protective to prevent the high concentration of mercury found in fish tissue. In addition to heavy metal contamination, the Central Valley Regional Water Quality Control Board (CVRWQCB) determined that the 25-mile reach of the Sacramento River from Keswick Dam downstream to Cottonwood Creek is impaired because the water periodically contains levels of dissolved cadmium, copper, and zinc that exceed levels identified to protect aquatic organisms. The 26-mile reach from Keswick Dam to Red Bluff is listed for unknown sources of toxicity (CVRWQCB 2007a).

#### *Lower Sacramento River and Delta*

Water quality in the lower Sacramento River is affected by agricultural runoff, acid mine drainage, stormwater discharges, water releases from dams, diversions, and urban runoff. However, the flow volumes generally provide sufficient dilution to prevent excessive concentrations of contaminants in the river.

Several total maximum daily loads (TMDL) are currently proposed for the lower Sacramento River. In addition, the Sacramento River downstream from RBDD to Knights Landing is listed as an impaired water body under Section 303(d) of the Clean Water Act (CWA) for mercury and unknown toxicity. Elevated metals and pesticide levels have been found at some sites in the Sacramento River Valley downstream from Knights Landing. The parameters of concern in the Sacramento River from Knights Landing to the Delta include diazinon, mercury, and unknown sources of toxicity (CVRWQCB 2007a, 2007b).

Water quality in the Delta is highly variable temporally and spatially. It is a function of complex circulation patterns that are affected by inflows, pumping for Delta agricultural operations and exports, operation of flow control structures, and tidal action. The existing water quality problems of the Delta system may be categorized as presence of toxic materials, eutrophication and associated fluctuations in dissolved oxygen, presence of suspended sediments and turbidity, salinity, and presence of bacteria (SWRCB 1999).

The Delta waterways within the area under CVRWQCB jurisdiction are listed as impaired on the U.S. Environmental Protection Agency’s (EPA) 303(d) list for dissolved oxygen, electrical conductivity (EC), dichlorodiphenyl-trichloroethane, mercury, Group A pesticides, diazinon and chlorpyrifos, and unknown toxicity (CVRWQCB 2003b). The area of the Delta that is under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (RWQCB) is listed as impaired for mercury, chlordane, selenium, dichlorodiphenyl-trichloroethane, dioxin compounds, polychlorinated biphenyl compounds, dieldrin, nickel, exotic species, and furan compounds (SFBRWQCB 2007).

Organic carbon in the Delta originates from runoff from agricultural and urban land, drainage water pumped from Delta islands that have soils with high organic matter, runoff and drainage from wetlands, wastewater discharges, and primary production in Delta waters. Delta agricultural drainage can also contain high levels of nutrients, suspended solids, organic carbon, minerals (salinity), and trace chemicals such as organophosphate, carbamate, and organochlorine pesticides.

Salinity is also an important water quality constituent in the Delta. Salinity in the Delta is the result of tidal exchange with San Francisco Bay, variations in freshwater inflow from the San Joaquin and Sacramento rivers, agricultural and urban exports/diversions, and agricultural return flows. During dry conditions, seawater intrusion is the primary factor influencing Delta salinity and can adversely affect agricultural and municipal uses. The highest concentrations typically occur in late summer or early fall.

#### *CVP/SWP Service Areas*

The CVP and SWP service areas are affected by water quality from the Delta. Water quality concerns of particular concern are those related to salinity and drinking-water quality. Salinity is an issue because excessive salinity may adversely affect crop yields and require more water for salt leaching, may require additional M&I treatment, may increase salinity levels in agricultural soils and groundwater, and is the primary water quality constraint to recycling wastewater (CALFED 2000b).

Constituents that affect drinking-water quality include bromide, natural organic matter, microbial pathogens, nutrients, total dissolved solids (TDS), hardness, alkalinity, pH, organic carbon, disinfection byproducts, and turbidity.

### 7.1.2 Sediment

#### *Shasta Lake and Vicinity*

Sediment-caused turbidity is one of the limiting water quality issues for Shasta Lake and its tributaries. It is a noticeable recurring water quality problem that affects beneficial uses, including recreation and fisheries. Within the reservoir, turbid water results from clay- and silt-sized soil particles suspended in the water column. Under certain conditions, inflow to the Pit Arm appears to be influenced by water quality conditions upstream from Shasta Lake, but monitoring data are not available to adequately document this phenomenon.

Before the construction of Shasta Dam, the widespread loss of vegetation caused by historic copper mining and smelting operations resulted in large-scale erosion, particularly in the watersheds that are tributary to the Main Body of Shasta Lake and the Squaw Creek Arm. In addition to sediment sources from upland areas, including roads and historic mining features, the construction and operation of Shasta Dam continue to influence erosional processes that introduce sediment into Shasta Lake, causing turbid conditions that are visible to the casual observer.

Nonpoint sources of fine sediment that increase turbidity in Shasta Lake include sediment discharge from tributaries, wave-related erosion below and adjacent to the fluctuating water surface, and surficial erosion of exposed surfaces as the lake levels fluctuate (USFS 1996). Erosion of the fine-textured soil and rock types that constitute much of the shoreline is a predominant factor in causing turbidity. The turbid water is noticeable along the shoreline throughout the year, but typically increases during wind and runoff events. Plumes of turbid water entering from tributaries are also visible periodically throughout the year. The fluctuation of lake levels, combined with various wave-generating processes, also influences the degree and location of erosion-related turbidity. Turbidity and, to a lesser degree, sediment suspended in the water column influence recreational uses of the lake, including fishing, swimming, and boating, by decreasing the clarity of the water along the shoreline.

Although some amount of fine sediment is transported downstream from Shasta Dam, the size and location of the reservoir provide an efficient sediment trap for material typically mobilized as bedload. Additional discussion of erosional processes is provided in Chapter 4, “Geology, Geomorphology, Minerals, and Soils.”

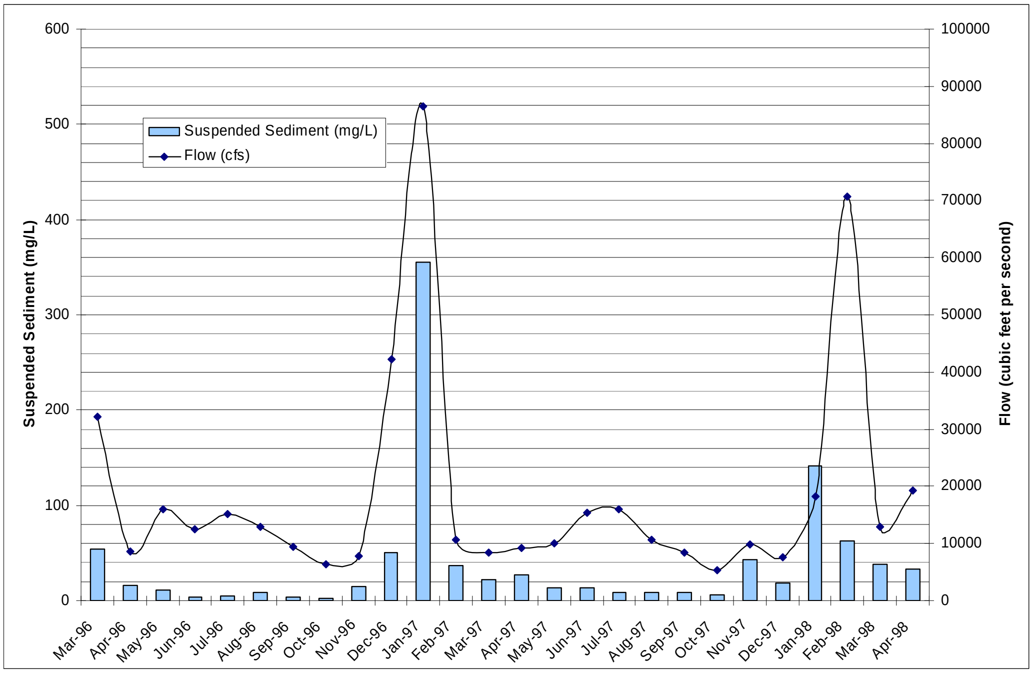
#### ***Upper Sacramento River (Shasta Dam to Red Bluff)***

Rates of loading and discharge of suspended sediment within the upper Sacramento River watershed have been altered by activities such as mining, smelting, agriculture, urbanization, and dam construction. The storage and diversion of water within reservoirs for either hydroelectric or other purposes can affect sediment yield, downstream sediment levels, and transport characteristics. In particular, dams such as Shasta can trap sediment and result in the depletion of coarse sediments needed by fisheries. This has resulted in the creation of gravel replenishment programs on the upper Sacramento River as part of the Central Valley Project Improvement Act restoration program.

Historic hydraulic gold mining has probably had the greatest effect on sediment yield in the Sacramento River watershed (Wright and Schoellhamer 2004). During the late 1800s, such mining introduced mass quantities of silt, sand, and gravel into the Sacramento River system. Suspended sediment was washed downstream into the Delta. Current sediment transport patterns in the Sacramento River watershed are greatly affected by the trapping of sediment in reservoirs such as Shasta Lake (Wright and Schoellhamer 2004).

Characteristics of peak-flow events are fundamental regulators of sediment mobilization, bed scour, riparian recruitment, and bank erosion. However, upstream sediment supply rates and sediment load distribution also affect suspended sediment loading (CALFED 2003). The upper Sacramento River contributes little coarse sediment from erosion because it is bounded by erosion-resistant bedrock and terrace deposits (Stillwater Sciences 2006). Therefore, today there is a decreasing trend in suspended sediment in the Sacramento River (Wright and Schoellhamer 2004).

USGS assessed concentrations of suspended sediment in the Sacramento River at Big Bend above Red Bluff from February 1996 to April 1998 (USGS 2000a). Concentrations of suspended sediment ranged from 3 milligrams per liter (mg/L) to 355 mg/L, with an average of 38.8 mg/L (see Figure 7-2).




*Source: USGS 2000a*

**Figure 7-2. Concentrations of Suspended Sediment and Associated Flows in the Sacramento River above Big Bend near Red Bluff**

### *Lower Sacramento River and Delta*

Delivery of suspended sediment from the Sacramento River to the Delta and finally to San Francisco Bay decreased by about one-half during the period 1957 to 2001 (Wright and Schoellhamer 2004). Factors contributing to this trend in sediment yield included the depletion of erodible sediment from hydraulic mining in the late 1800s, trapping of sediment in reservoirs, riverbank protection, altered land uses, and levee construction.

Sediment supply to the Sacramento and San Joaquin river watersheds has declined over recent years because dams on rivers and other water management actions have resulted in less sediment transport (CALFED 2000c), although agricultural drainage in the Delta often contains high levels of suspended sediments (Reclamation and DWR 2005). Sediments that include fine sands, silts, and clays are transported by rivers and the Yolo Bypass into the Delta. Coarser materials are deposited at points higher up in the river basins. The sands typically are transported in the bed load, while the clays and silts move the suspended load. The suspended load is composed of generally finer materials moving downstream in the water column. Sediment loads from the Sacramento River are higher than those from the San Joaquin River (Reclamation and DWR 2005).

Hydraulic gold mining, particularly through the major westerly flowing tributaries such as the American, Feather, Yuba, and Bear rivers, may also affect sediment transport in the extended study area. USGS found that the Sacramento River is the primary supplier of suspended sediment to the Delta.

#### *CVP/SWP Service Areas*

Some suspended sediments are transported within the CVP and SWP service areas, but turbidity and sedimentation are not issues within the service areas (CALFED 2000c).

### 7.1.3 Temperature

#### *Shasta Lake and Vicinity*

Water temperature is an important water quality parameter affecting the beneficial uses of Shasta Lake and its tributaries, including contact and noncontact recreation and aquatic organisms. Within the reservoir, water temperature commonly controls the growth of algae and the rate of biochemical processes. Shasta Lake periodically stratifies and a thermocline develops on an annual basis, although turnover is incomplete and the lake has not been known to freeze over (Bartholow et al. 2001). Strong stratification of the reservoir occurs during summer at a depth of 10 to 15 meters. This stratification isolates the epilimnion from nutrients available in the deeper hypolimnion, segregating spring and fall algal blooms when water temperatures might otherwise support algal production in the euphotic zone, the zone close to the surface that provides opportunities for photosynthesis. The period of stratification generally overlaps with the peak recreation season (May to September), when surface water temperatures are comfortable for contact recreation activities. During fall, the stratification dissipates and the surface water temperature is reduced.

Shasta Dam operations greatly influence the annual and seasonal water temperature of the reservoir. The wetness of a given water year or series of years generally controls the mean annual water temperature. The current temperature regime of Shasta Lake is related to CVP operational requirements, including those necessary to optimize the water temperatures in the Sacramento River downstream from Keswick Dam. Overall, the tributaries that enter Shasta Lake meet the Basin Plan water quality objective for temperature.

### *Upper Sacramento River (Shasta Dam to Red Bluff)*

Water temperature in the Sacramento River from Shasta Dam to Keswick Dam is determined primarily by Shasta Dam releases. Shasta Dam release flows are then mixed with flows from Whiskeytown Reservoir at Keswick Reservoir and released into the upper Sacramento River.

Water temperature for rivers within the Sacramento River basin is reportedly maintained consistent with regulatory requirements (e.g., NMFS biological opinion (BO)) most of the time, but temperature management can be difficult during low-flow periods (USGS 2000a). Historically, low-flow events and a lack of flexibility in dam operations can cause water temperatures to periodically approach critical levels for sustaining juvenile salmon populations. In addition to low flows, high water temperatures released from reservoirs, coupled with natural instream warming, can cause elevated river water temperatures (Vermeyen 1997).

There are a number of water quality objectives for the upper Sacramento River. The Basin Plan specifies that water temperature shall not be elevated above 56 degrees Fahrenheit (°F) from Keswick Dam to Hamilton City (+9). In addition, the Basin Plan specifies that at no time or place shall the temperature of cold or warm intrastate waters be increased more than 5°F above natural receiving-water temperature (CVRWQCB 2009). Keswick Dam releases are managed to meet temperature control requirements.

According to the 2004 BO for CVP and SWP operations for the Sacramento River winter-run Chinook salmon, the Sacramento River water temperatures will be below 56°F at compliance locations between Balls Ferry and Bend Bridge from April 15 through September 30, and not in excess of 60°F at the same compliance locations between Balls Ferry and Bend Bridge from October 1 through October 31. On December 15, 2008, USFWS issued a BO on the Operations Criteria and Plan (OCAP) for delta smelt and its critical habitat governing the coordinated operations of the CVP and SWP. On June 4, 2009, NMFS issued the NMFS OCAP BO for listed anadromous fishes and marine mammal species and their critical habitats governing the long-term operations of the CVP and SWP. On May 18, 2010, in *The Consolidated Salmonid Cases*, Judge Oliver Wanger concluded that NMFS likely violated the Federal Endangered Species Act by failing to rely on the “best available science” when drafting its June 4, 2009, BO. Similarly, on May 27, 2010, Judge Wanger concluded that USFWS violated NEPA in failing to conduct environmental review before establishing pumping restrictions to protect delta smelt. The BOs and their requirements remain in litigation and are subject to change.

Before 1997, to help meet the needs of Federally listed winter-run Chinook salmon, cold water was released from low outlets at Shasta Dam. These cold-water releases bypassed hydropower facilities, causing the loss of power revenues. To achieve water temperature objectives in the Sacramento River without interrupting power generation, Reclamation constructed a temperature control device (TCD) on Shasta Dam that became operational in 1997. The TCD allows selective withdrawal of water from different reservoir depths without bypassing power generation, provides flexibility to Shasta Dam operations, and allows downstream temperature goals to be consistently achieved (Reclamation 2004).

Historical Sacramento River water temperatures below Shasta Dam were analyzed from January 1991 through December 2005. The data set indicates that average temperatures vary seasonally, ranging from 47.9°F in February to 55.7°F in November. Water temperatures below Keswick Dam were analyzed for January 1990 through December 2006. Like the temperatures below Shasta Dam, average temperatures below Keswick Dam vary seasonally, ranging from 47.8°F in February to 54.9°F in November. Summer and fall temperatures typically increase by about 7°F. Water temperatures just downstream from Keswick Dam are influenced by releases from Shasta Lake and Whiskeytown Reservoir and Keswick Dam operations.

#### *Lower Sacramento River and Delta*

Water temperature in the Sacramento River at Colusa varies seasonally, ranging from 47.5°F to 67.5°F. Water temperatures gradually increase through the spring and summer and reach an average of about 65°F. Water temperature in the Sacramento River at Freeport varies seasonally, ranging from 48.7°F to 72.1°F (USGS 2000).

Water temperature in the Delta is influenced only slightly by water management activities (i.e., dam releases) (Reclamation and DWR 2005). The 2004 and 2009 BOs for Sacramento River winter-run Chinook salmon are among the most influential factors governing Shasta releases, in terms of both quantity and timing (NMFS 2004, 2009). The BOs sets temperature requirements below Keswick Dam for April through October. In years when CVP facilities cannot be operated to meet required temperature and storage objectives, Reclamation reinitiates consultation with NMFS (Reclamation 2004a).

#### *CVP/SWP Service Areas*

Water quality in the CVP and SWP service areas, including water temperature, is affected by fluctuations of water quality in the Delta, which in turn are influenced by water quality in the San Joaquin River, CVP and SWP export pumping rates, local agricultural diversions and drainage water, and the Sacramento River (CALFED 2000c).

### 7.1.4 Metals

#### *Shasta Lake and Vicinity*

Certain areas of Shasta Lake have been identified as impaired by toxic metal pollutants. For this reason, Shasta Lake is listed on the CWA Section 303(d) list of impaired water bodies. For water bodies on the Section 303(d) list, the CWA requires the development of TMDL allocations for the pollutants of concern. A

TMDL allocation must estimate the total maximum daily load, with seasonal variations and a margin of safety, for all suitable pollutants and thermal loads, at a level that would ensure protection and propagation of a balanced population of indigenous fish, shellfish, and wildlife. Table 7-2 shows the potential sources of pollution within specific areas of Shasta Lake, along with the TMDL priority and the estimated affected area of the pollutants.

**Table 7-2. 303(d) List of Water Quality Limited Segments, Shasta Lake, 2006**

| Pollutant | Potential Sources | TMDL Priority | Estimated Area Affected |
|---|---|---|---|
| **Horse Creek (from Rising Star Mine to Squaw Creek Arm of Shasta Lake)** | | | |
| Cadmium | Resource extraction | Low | 0.52 mile |
| Copper | Resource extraction | Low | 0.52 mile |
| Lead | Resource extraction | Low | 0.52 mile |
| Zinc | Resource extraction | Low | 0.52 mile |
| **Area where West Squaw Creek enters Squaw Creek Arm of Shasta Lake** | | | |
| Cadmium | Resource extraction | Low | 20 acres |
| Copper | Resource extraction | Low | 20 acres |
| Zinc | Resource extraction | Low | 20 acres |

*Source: SWRCB 2006*

Key:
TMDL = total maximum daily load

Waters discharged by stream channels draining the areas disturbed by the mining of sulfide ore deposits are generally acidic and contain high concentrations of dissolved metals, including iron, copper, and zinc. The streams with the highest metal concentrations are Flat, Little Backbone, Spring, Squaw, Horse, and Zinc creeks (USGS 1978). Dissolved metals concentrations discharged by these streams violate water quality objectives (CVRWQCB 2003b). The sources of the metals are surface and groundwater discharge from underground mines and waters flowing through open pits, tunnels, mine tailings, waste rock, and tertiary deposits that include modern alluvium along the shoreline. Interaction with sulfide minerals and erosion of metal-rich material commonly result in low pH readings and high metal concentrations.

The sources of the metals in the two areas identified in Table 7-2 are associated with the Bully Hill/Rising Star mining complex adjacent to the Squaw Creek Arm. Although the mines are no longer operational and remedial action continues, these areas are a documented source of metals and continue to be subject to an abatement order issued by the CVRWQCB. A containment structure constructed sometime during the early 1900s has filled with sediment downstream from the Bully Hill Mine. No information is available on the character of the material stored behind this earth fill dam. In 2006, North State Resources, Inc., conducted a Phase 1 Site Assessment of an area adjacent to, but over a small divide from, the Bully Hill Mine. This assessment documented elevated levels of sulfide minerals in sediment samples and extremely low pH values in surface waters draining the mine (NSR 2007).

Tributaries to the Main Body of Shasta Lake are also a source of metals, along with acid mine drainage from a number of mines in the Dry Creek and Little Backbone watersheds. In addition to runoff from the historic workings (i.e., adits and portals), there are a number of large tailing deposits that are currently leaching various metals into tributaries to Shasta Lake (CVRWQCB 2003a).

Between 2002 and 2003, the CVRWQCB conducted an investigation intended to increase the understanding of the relationship between elevated metal concentrations (dissolved copper and zinc) in discharges from Shasta Dam and the temporal and spatial distribution of these metals within and upslope of Shasta Lake (CVRWQCB 2003a). Specifically, this investigation attempted to answer two questions:

- Why do these elevated metal concentrations appear seasonally?
- Are the concentrations somehow related to the operation of the temperature control device that is attached to the upstream face of Shasta Dam?

In 2003, the CVRWQCB issued an interim report that provided data and limited analysis at 17 sites upstream from Shasta Dam. The data set included 412 discrete samples and included 1,043 specific chemical analyses for various chemical constituents (CVRWQCB 2003b). The interim report offers the following conclusion: “This study shows a direct correlation between dissolved copper concentrations in the upper water column near the dam and dissolved copper concentrations immediately downstream from the dam in the winter months.” The report goes on to suggest that this correlation may somehow be related to the operation of the temperature control device as it relates to the seasonal thermocline that develops in Shasta Lake (CVRWQCB 2003b).

#### *Upper Sacramento River (Shasta Dam to Red Bluff)*

A major source of metals to the Sacramento River is drainage from inactive mines in the Iron Mountain area of the West Shasta mining district. During mining and smelting activities from the 1880s to the 1960s, Iron Mountain’s acid mine drainage discharged directly to Spring Creek, a Sacramento River tributary upstream from Redding (USGS 2000b).

USGS conducted a water quality assessment of trace metal concentrations in the Sacramento River at Big Bend above Red Bluff from February 1996 to May 1998 (USGS 2000b). Although metals concentrations are a serious water quality concern in the project area, metals did not exceed water quality objectives during the study period.

The CVRWQCB has determined that the 25-mile segment of the upper Sacramento River between Keswick Dam and Cottonwood Creek near Balls Ferry in Shasta County is impaired because of levels of dissolved cadmium, copper, and zinc that exceed water quality standards (CVRWQCB 2002). The impairment results primarily from inactive mines in the upper Sacramento River watershed, predominantly the Iron Mountain site upstream from Keswick Dam and other mines upstream from Shasta Dam.

Water quality enhancement actions at the mines and improved coordination of the Spring Creek and Keswick Reservoirs have resulted in a notable decrease in the number of water quality targets exceeded in the past 10 years. However, metal loading remains high enough to cause periodic exceedences (CVRWQCB 2002). The sediments found in the Spring Creek Arm of Keswick Reservoir contain high levels of copper and zinc, which settled out of the contaminated stormwater runoff from the Iron Mountain Mine Superfund site. In 2009 and 2010, EPA dredged and removed contaminated sediments at this location with the goal of protecting the downstream Sacramento River ecosystem during storm events, when contaminated sediments can become mobilized and carried downstream. EPA expects that dredging the contaminated sediments will eliminate the last major threat that contamination from the Iron Mountain Mine poses to human health and the environment (EPA 2009).

High mercury concentrations in the Sacramento River correlate with concentrations of suspended sediment and high flows, because much of the mercury is transported adsorbed to suspended sediments (Domagalski et al. 2000). In May 2000, EPA adopted a water quality objective for total mercury for the Sacramento River watershed of 50 nanograms per liter (30-day average). In a USGS study of mercury levels along the Sacramento River at Big Bend above Red Bluff, conducted from February 1996 to May 1998, mercury levels were consistently below the EPA criterion of 50 nanograms per liter (USGS 2000b).

#### *Lower Sacramento River and Delta*

The downstream tributaries Cache Creek and Putah Creek are known to be substantial sources of mercury to the Sacramento River. The Sacramento River from Knights Landing to the Delta is listed as impaired on EPA's 303(d) list for mercury (CVRWQCB 2002).

The Delta waterways within the area under CVRWQCB jurisdiction are listed on EPA's 303(d) list as impaired for mercury from agriculture and historic mining, while the western Delta, under the jurisdiction of the San Francisco Bay RWQCB, is listed as impaired for mercury, nickel, and selenium. The primary sources of mercury are abandoned mine sites in the upper watershed that drain into the lower Sacramento River and Delta. The City of Sacramento is also the largest urban source of nitrogen, mercury, and assorted other urban waste products. Selenium concentrations are attributed to agriculture and oil refiners, while the primary source of nickel is unknown (SWRCB 2006).

#### *CVP/SWP Service Areas*

Water quality in the CVP and SWP service areas is affected by fluctuations of water quality in the south Delta, which in turn are influenced by water quality in the San Joaquin River, CVP and SWP export pumping rates, local agricultural diversions and drainage water, and the Sacramento River (CALFED 2000c).

### 7.1.5 Salinity

The following discussion of the affected environment in the study area with regard to salinity is limited to a discussion of conditions in the lower Sacramento River and Delta portion of the extended study area because of the potential effects of salinity in this geographic area on beneficial uses. Salinity is particularly important in the Delta, which is influenced by tidal exchange with San Francisco Bay; during low-flow periods, seawater intrusion results in increased salinity.

#### *Lower Sacramento River and Delta*

The following are recognized water quality issues in the Delta (Reclamation and DWR 2005):

- High salinity from Suisun Bay intrudes into the Delta during periods of low Delta outflow. Salinity can adversely affect agricultural, M&I, and recreational uses.

- Delta exports contain elevated concentrations of disinfection byproduct precursors (e.g., dissolved organic carbon), and the presence of bromide increases the potential for formation of brominated compounds in treated drinking water.

- Agricultural drainage in the Delta contains high levels of nutrients, suspended solids, dissolved organic carbon and minerals (salinity), and agricultural chemicals (pesticides).

- Synthetic organic chemicals and heavy metals have bioaccumulated in Delta fish and other aquatic organisms, occasionally exceeding standards for food consumption.

- The San Joaquin River delivers relatively poor-quality water to the Delta; agricultural drainage is a major source of salts and pollutants. Because the south Delta receives a substantial portion of water from the San Joaquin River, the influence of this relatively poor San Joaquin River water quality is greatest in the south Delta channels and in CVP and SWP exports.

Trends in Delta water quality reflect the effects of river inflows, tidal exchanges with San Francisco Bay, diversions, and pollutant releases. The north Delta tends to have better water quality primarily because of inflow from the Sacramento River. The quality of water in the west Delta is strongly influenced by tidal exchange with San Francisco Bay; during low-flow periods, seawater intrusion results in increased salinity. In the south Delta, water quality tends to be poorer because of the combination of inflows of poorer water quality from the San Joaquin River, discharges from Delta islands, export pumping, seasonal agricultural barriers, and effects of diversions that can sometimes increase seawater intrusion from San Francisco Bay.

The Sacramento and San Joaquin rivers contribute approximately 61 percent and 33 percent, respectively, to TDS concentrations within the Delta from tributary inflows. TDS concentrations are relatively low in the Sacramento River, but because of its large volumetric contribution, the river provides the majority of the TDS load supplied by tributary inflow to the Delta (DWR 2001). Although actual flow from the San Joaquin River is lower than flow from the Sacramento River, TDS concentrations in San Joaquin River water average approximately seven times the TDS concentrations in the Sacramento River.

## 7.2 Regulatory Framework

Several regulatory authorities at the Federal, State, and local levels control the flow, quality, and supply of water in California either directly or indirectly. This section focuses on laws related directly to the water quality aspect of the project.

Management of the Delta is partly determined by Federal and State regulations developed to protect both human and environmental beneficial uses. Primary institutional and regulatory influences on the use and management of the Delta consist of the CVP; the SWP; direct Delta diverters, including Contra Costa Water District (CCWD), Solano County Water Agency, and the City of Stockton Metropolitan Area; San Francisco Bay water quality needs; and multiple regulations governing protection of endangered species.

At the State level, the SWRCB and the RWQCBs regulate and monitor Delta water quality. Nine regional boards oversee water quality in California. Two of these, the CVRWQCB and San Francisco Bay RWQCB, oversee Delta water quality. EPA also plays an important role under the auspices of the CWA and the Safe Drinking Water Act (SDWA). The California Department of Public Health has an interest in the Delta because the Delta is the source of drinking water for more than 23 million Californians. DWR extensively monitors Delta water quality as part of its Municipal Water Quality Investigations program; in cooperation with Reclamation, DWR monitors Delta water quality under the SWRCB’s compliance monitoring requirements.

At the local level, water agencies that divert from the Delta have both strong interest in and influence on Delta water quality management. These agencies include CCWD, Solano County Water Agency, and City of Stockton Metropolitan Area.

Two agencies with key planning roles in the Delta are the California Bay-Delta Authority and the Delta Protection Commission. The California Bay-Delta Authority became a State agency in January 2003, and is responsible for implementing the CALFED Bay-Delta Program (CALFED). State legislation created the Delta Protection Commission in 1992 with the goal of developing regional policies for the Delta to protect and enhance existing land uses. In 2000, the commission was made a permanent State agency. The Delta Protection Commission comments on applications for CALFED ecosystem restoration grants that affect the Delta, and participates in meetings with other CALFED agencies to provide input to CALFED management decisions.

### 7.2.1 Federal

#### *Safe Drinking Water Act*

The SDWA was established to protect the quality of drinking water in the United States. The SDWA authorized EPA to set national health-based standards for drinking water and requires many actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells. Furthermore, the SDWA requires all owners or operators of public water systems to comply with primary (health-related) standards. EPA has delegated to the California Department of Public Health, Division of Drinking Water and Environmental Management, the responsibility for administering California’s drinking-water program. California Department of Public Health is accountable to EPA for program implementation and for adopting standards and regulations that are at least as stringent as those developed by EPA. Contaminants of concern relevant to domestic water supply are defined as those that pose a public health threat or that alter the aesthetic acceptability of the water. These types of contaminants are regulated by EPA primary and secondary maximum contaminant levels that are applicable to treated water supplies delivered to the distribution system. maximum contaminant levels and the process for setting these standards are reviewed triennially.

#### *Clean Water Act*

The CWA is the major Federal legislation governing the water quality aspects of the project. The objective of the act is “to restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” The CWA establishes the basic structure for regulating discharge of pollutants into the waters of the United States and gives EPA the authority to implement pollution control programs such as setting wastewater standards for industries. In certain states such as California, EPA has delegated authority to state agencies.

**Section 303** This section of the CWA requires states to adopt water quality standards for all surface waters of the United States. The three major components of water quality standards are as follows:

- **Designated uses –** Uses that society, through the Federal and State governments, determines should be attained in the water body, such as supporting communities of aquatic life, supplying water for drinking, irrigating crops and landscaping, and industrial purposes, and recreational uses (e.g., fishing, swimming, boating).

- **Water quality criteria** – Levels of individual pollutants or water quality characteristics, or descriptions of conditions of a water body that, if met, will generally protect the designated use of the water. Water quality criteria must be scientifically consistent with attainment of designated uses, which means that only scientific considerations can be taken into account when determining what water quality conditions are consistent with meeting a given designated use. Economic and social impacts are not considered when developing water quality criteria.

- **Antidegradation policy** – Designed to prevent deterioration of existing levels of good water quality (see the "Antidegradation Policy" section below for more information).

Where multiple uses exist, water quality standards must protect the most sensitive use. In California, EPA has given the SWRCB and its nine RWQCBs the authority to identify beneficial uses and adopt applicable water quality objectives.

Section 303(d) of the CWA requires states and authorized Native American tribes to develop a list of water quality–impaired segments of waterways. The list includes waters that do not meet water quality standards necessary to support the beneficial uses of that waterway, even after point sources of pollution have installed the minimum required levels of pollution control technology. Only waters impaired by "pollutants," not those impaired by other types of "pollution" (e.g., altered flow and/or channel modification), are to be included on the list. (Pollutants include clean sediments, nutrients (e.g., nitrogen and phosphorus), pathogens, acids/bases, temperature, metals, cyanide, and synthetic organic chemicals.)

Section 303(d) of the CWA also requires states to maintain a listing of impaired water bodies so that a TMDL can be established. A TMDL is a plan to restore the beneficial uses of a stream or to otherwise correct an impairment. It establishes the allowable pollutant loadings or other quantifiable parameters (e.g., pH or temperature) for a water body and thereby provides the basis for the establishment of water quality-based controls. The calculation for establishment of TMDLs for each water body must include a margin of safety to ensure that the water body can be used for the purposes the State has designated. Additionally, the calculation also must account for seasonal variation in water quality. The CVRWQCB develops TMDLs for the Sacramento River (see discussion on the Porter-Cologne Water Quality Control Act below). Sedimentation/siltation impacts are the primary water quality parameters of concern with construction projects.

Reductions in pollutant loading are achieved by implementing strategies authorized by the CWA, such as the following, which are discussed in more detail below.

- **Section 401 –** This section of the CWA requires Federal agencies to obtain certification from the State or Native American tribes before issuing permits that would result in increased pollutant loads to a water body. The certification is issued only if such increased loads would not cause or contribute to exceedences of water quality standards.
- **Section 402 –** This section creates the National Pollutant Discharge Elimination System (NPDES) permit program. This program covers point sources of pollution discharging into a surface water body.
- **Section 404 –** This section regulates the placement of dredged or fill materials into wetlands and other waters of the United States.

**Section 401 – Water Quality Certification** This section of the CWA requires an applicant for any Federal license or permit (e.g., a Section 404 permit) that may result in a discharge into waters of the United States to obtain a certification from the State that the discharge would comply with provisions of the CWA. The SWRCB and RWQCBs administer this program. The SWRCB issues Section 401 certifications for projects that would take place in two or more regions. Any condition of a Section 401 certification (or water quality certification) would be incorporated into the USACE permit.

For the primary study area the CVRWQCB has jurisdiction, while the extended study area encompasses the San Francisco Bay, Central Coast, Los Angeles, Lahontan, Colorado River Basin, Santa Ana, and San Diego RWQCBs. A Section 401 certification would not be required from the RWQCBs within the extended study area because no construction would occur in the extended study area.

**Section 402 – National Pollutant Discharge Elimination System** All point sources that discharge into waters of the United States must obtain an NPDES permit under provisions of Section 402 of the CWA. As with Section 401, the SWRCB and RWQCBs are responsible for implementing the NPDES permitting process at the State and regional levels, respectively.

The NPDES permit process also provides a regulatory mechanism for controlling nonpoint-source pollution created by runoff from construction and industrial activities, and general and urban land use, including runoff from streets. Projects involving construction activities (e.g., clearing, grading, or excavation) involving land disturbance greater than one acre must file a notice of intent with the appropriate RWQCB(s) to indicate their intent to comply with the General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit Order 2009-0009-DWQ, which went into effect and replaced Order 99-08-DWQ on July 1, 2010). This general permit establishes conditions to minimize sediment and pollutant loadings and requires preparation and implementation of a stormwater pollution prevention plan (SWPPP) before construction. The SWPPP is intended to help identify the sources of sediment and other pollutants, and to establish best management practices (BMP) for stormwater and nonstormwater source control and pollutant control. A sediment monitoring plan must be included in the SWPPP if the discharges occur directly to a water body listed on the Section 303(d) TMDL list for sediment.

For the primary study area the CVRWQCB has jurisdiction. A NPDES would not be required from the RWQCBs within the extended study area because no construction would occur.

**Section 404 – Discharge of Dredged or Fill Material into Waters of the United States** Section 404 deals with one broad type of pollution – the placement of dredged or fill material into "waters of the United States." Jurisdictional limits of these features are typically noted by the ordinary high-water mark. Isolated ponds or seasonal depressions had been previously regulated as waters of the United States. However, in *Solid Waste Agency of Northwestern Cook County v. United States Army Corps of Engineers et al.* (January 8, 2001), the U.S. Supreme Court ruled that certain "isolated" wetlands (e.g., nonnavigable, isolated, and intrastate) do not fall under the jurisdiction of the CWA and are no longer under USACE jurisdiction. (Although isolated wetlands may not be under Federal regulation, they are regulated by the State of California (see Porter-Cologne Water Quality Control Act discussion below).) Some circuit courts (e.g., *U.S. v. Deaton*, 2003; *U.S. v. Rapanos*, 2003; *Northern California River Watch v. City of Healdsburg*, 2006), however, have ruled that Solid Waste Agency of Northwestern Cook County does not prevent CWA jurisdiction if a "significant nexus" such as a hydrologic connection exists. The hydrologic connection may be human-made (e.g., roadside ditch) or a natural tributary to navigable waters, or direct seepage from the wetland to the navigable water, a surface or underground hydraulic connection. An ecological connection (e.g., the same bird, mammal, and fish populations are supported by both the wetland and the navigable water) and changes to chemical concentrations in the navigable water caused by water from the wetland may also constitute a significant nexus.

The discharge of dredge or fill generally includes the following activities:

- Placement of fill that is necessary for the construction of any structure or infrastructure in a water of the United States
- The building of any structure, infrastructure, or impoundment requiring rock, sand, dirt, or other material for its construction
- Site-development fills for recreational, industrial, commercial, residential, or other uses
- Causeways or road fills
- Dams and dikes
- Artificial islands
- Property protection and/or reclamation devices such as riprap, groins, seawalls, breakwaters, and revetments
- Beach nourishment
- Levees
- Fill for structures such as sewage treatment facilities, intake and outfall pipes associated with powerplants, and subaqueous utility lines
- Placement of fill material for construction or maintenance of any liner, berm, or other infrastructure associated with solid waste landfills
- Placement of overburden, slurry, or tailings or similar mining-related materials
- Artificial reefs

USACE regulations and policies mandate avoiding the filling of wetlands unless it can be demonstrated that no practicable alternatives (to filling wetlands) exist. There are four basic processes for obtaining Section 404 authorization from USACE. Because of its scale and potential impact, this project would require an individual permit.

For the primary study area, USACE's Sacramento District has jurisdiction, while the extended study area encompasses the San Francisco and Los Angeles Districts of USACE.

#### *Antidegradation Policy*

The antidegradation policy, established in 1968 and revised in 2005 (Title 40, Section 131.12 of the Code of Federal Regulations), is designed to protect existing uses and water quality and national water resources, as authorized by Section 303(c) of the CWA. At a minimum, the policy and implementation methods must be consistent with the following:

- Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
- Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control.
- Where high-quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected.

Although the quality of water in the upper Sacramento River is relatively good, water quality problems do occur, including the presence of mercury, pesticides such as organochlorine pesticides, trace metals, turbidity, and toxicity from unknown origin (CALFED 2000a).

The CWA requires states to maintain a listing of impaired water bodies so that a TMDL can be established. A TMDL is a plan to restore the beneficial uses of a stream or to otherwise correct an impairment. The most prevalent contaminants in the Sacramento River basin are for organophosphate pesticides (agricultural runoff) and trace metals (acid mine drainage), for which TMDLs currently are being considered. Only during conditions of stormwater-driven runoff are water quality objectives typically not met (Domagalski et al. 2000).

#### ***Shasta-Trinity National Forest Land and Resource Management Plan***

The STNF is guided by various laws, regulations, and policies that provide the framework for all levels of planning. These include regional guides, the *Shasta-Trinity National Forest Land and Resource Management Plan,* and site-specific planning documents, such as this document.

The *Shasta-Trinity National Forest Land and Resource Management Plan* provides guidance for managing National Forest System lands in the STNF. The development of a Forest land and resource management plan (LRMP) occurs within the framework of regional and national USFS planning. The LRMP includes forest goals; forest objectives, including forest-wide prescription assignment by acres, outputs, and activities; and forest standards and guidelines. Forest goals state the management philosophy of the LRMP, and the Forest objectives describe the purpose of the management prescriptions. The Forest-wide management prescriptions apply a management theme to specific types of land (e.g., wilderness, roaded high-density recreation).

In essence, this LRMP requires that projects authorized by the STNF be designed and implemented in a manner that maintains the existing conditions or implements actions to restore biological and physical processes within their natural range of variability.

**Water Quality**
*Goals (LRMP, p. 4-6)*

- Maintain or improve water quality and quantity to meet fish habitat requirements and domestic use needs.
- Maintain water quality to meet or exceed applicable standards and regulations.

*Standards and Guidelines (LRMP, p. 4-25)*

- Implement BMPs for protection or improvement of water quality, as described in "Water Quality Management for National Forest System Lands in California," for applicable management activities. Determine specific practices or techniques during project level planning using information obtained from on-site soil, water, and geology investigations.

**Best Management Practices**
*Standards and Guidelines (LRMP, Appendix E)*

- STNF water quality BMPs were developed in compliance with Section 208 of the Federal CWA, Public Law 92-500, as amended and are certified by the RWQCB and approved by EPA. The following BMPs are applicable to the proposed action:

**Road Building and Site Construction**
*Standards and Guidelines (LRMP, Appendix E, pp. E-2 through E-3)*

- General guidelines for the location and design of roads
- Erosion control plan
- Timing of construction activities
- Road slope stabilization (preventive practice)
- Road slope stabilization (administrative practice)

- Dispersion of subsurface drainage from cut and fill slopes
- Control of road drainage
- Construction of stable embankments
- Minimization of sidecast material
- Servicing and refueling equipment
- Control of construction in riparian management zones
- Controlling in-channel excavation
- Diversion of flows around construction sites
- Bridge and culvert installation
- Disposal of right-of-way and roadside debris
- Specifying riprap composition
- Maintenance of roads
- Road surface treatment to prevent loss of materials
- Traffic control during wet periods
- Surface erosion control at facility sites

**Recreation**

*Standards and Guidelines (LRMP, Appendix E, p. E-3)*

- Sampling and surveillance of designated swimming sites
- On-site interdisciplinary sanitary surveys will be conducted to augment the sampling of swimming waters
- Documentation of water quality data
- Control of sanitation facilities
- Control of refuse disposal
- Protection of water quality within developed and dispersed recreation areas

#### *U.S. Bureau of Land Management*

The U.S. Bureau of Land Management's Resource Management Plan, which is its plan for managing Federal lands in Shasta County, was amended by the 1994 Record of Decision (ROD) for the Northwest Forest Plan (Final Supplemental Environmental Impact Statement (EIS) for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl). This amendment required preparation of Watershed Analysis prior to initiating U.S. Bureau of Land Management activities. As a party to the Northwest Forest Plan, U.S. Bureau of Land Management, like USFS, is also required to ensure that projects are consistent with the Aquatic Conservation Strategy.

#### *Biological Opinions on the Long-term Central Valley Project and State Water Project Operations Criteria and Plan*

During the past 6 years, NMFS and USFWS BOs regarding effects of the proposed OCAP have been revised twice. On October 22, 2004, NMFS issued a BO regarding effects of the proposed OCAP for the CVP in coordination with the SWP on winter-run Chinook salmon, spring-run Chinook salmon, Central Valley steelhead, Southern Oregon/Northern California Coast Coho salmon, and Central California Coast steelhead and their designated critical habitat. On February 16, 2005, USFWS issued a BO regarding effects of the proposed OCAP on delta smelt. The 2004 and 1995 BOs supersede the prior BOs issued by NMFS and USFWS, and contain reasonable and prudent measures and terms and conditions that specify fisheries monitoring actions, spawning gravel augmentation, forecasting of deliverable water, management of cold-water supply within reservoirs, temperature monitoring, adaptive management processes to analyze annual cold-water management, minimization of flow fluctuations, passage at RBDD, operation of gates in the Delta, fish screening at pumping facilities, and numerous other effects minimization measures. In response to litigation, the 2004 and 2005 BOs were remanded to USFWS and NMFS for revision, but were not vacated. USFWS and NMFS released revised BOs in 2008 and 2009, respectively. These revised BOs are in litigation.

### 7.2.2 State

#### *Porter-Cologne Water Quality Control Act*

The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) is California's statutory authority for the protection of water quality. Under the act, the State must adopt water quality policies, plans, and objectives protecting the State's waters for the use and enjoyment of the people. Obligations of the SWRCB and RWQCBs to adopt and periodically update their basin plans are set forth in the act. A basin plan identifies the designated beneficial uses for specific surface water and groundwater resources, applicable water quality objectives necessary to support the beneficial uses, and implementation programs that are established to maintain and protect water quality from degradation for each of the RWQCBs. The act also requires waste dischargers to notify the RWQCBs of their activities through the filing of reports of waste discharge and authorizes the SWRCB and RWQCBs to issue and enforce waste discharge requirements (WDR), NPDES permits, Section 401 water quality certifications, or other approvals. The RWQCBs also have authority to issue waivers to reports of waste discharge/WDRs for broad categories of "low threat" discharge activities that have minimal potential for adverse water quality effects when implemented according to prescribed terms and conditions.

The CVRWQCB Basin Plan (originally published in 1998, last revised in September 2009) (CVRWQCB 2009) regulates waters of the State located within the primary study area. The CVRWQCB Basin Plan covers an area including the entire Sacramento and San Joaquin river basins, involving an area bounded by the crests of the Sierra Nevada on the east and the Coast Ranges and Klamath Mountains on the west. The area covered in the CVRWQCB Basin Plan extends some 400 miles, from the California/Oregon border southward to the headwaters of the San Joaquin River, encompassing a substantial portion of the extended study area. The beneficial uses of the Sacramento River are as follows (CVRWQCB 2009):

- Municipal and domestic supply
- Irrigation and stock watering
- Service supply
- Power
- Contact recreation and canoeing and rafting
- Other noncontact recreation
- Freshwater habitat (warm and cold)
- Migration habitat (warm and cold)
- Spawning habitat (warm and cold)
- Wildlife habitat
- Navigation

The Basin Plan recognizes Shasta Reservoir (i.e., Shasta Lake) as a discrete water body and identifies a number of specific beneficial uses:

- Municipal and domestic supply
- Agricultural supply
- Hydropower generation

- Water contact recreation
- Noncontact recreation
- Freshwater habitat (warm and cold)
- Spawning, reproduction, and/or early development
- Wildlife habitat

The CVRWQCB has also promulgated water quality objectives for all surface waters in the Sacramento and San Joaquin River basins (CVRWQCB 2009) for the following:

- Bacteria levels
- Biostimulatory substances
- Chemical constituents
- Color
- Dissolved oxygen
- Floating material
- Methylmercury
- Oil and grease
- pH
- Pesticides
- Radioactivity
- Salinity
- Sediment
- Settleable material
- Suspended material
- Tastes and odors
- Temperature
- Toxicity
- Turbidity

**Primary Study Area** The CVRWQCB determined that the 25-mile reach of the Sacramento River from Keswick Dam downstream to Cottonwood Creek is impaired because the water periodically contains levels of dissolved cadmium, copper, and zinc that exceed levels identified to protect aquatic organisms.

Consequently, the CVRWQCB developed a TMDL program for dissolved cadmium, copper, and zinc loading into the upper Sacramento River because of these exceedences of water quality standards (CVRWQCB 2002) and has proposed implementing the water quality objectives listed in Table 7-3 as numeric targets for this TMDL. No other TMDLs have been finalized for this area (CVRWQCB 2007a).

**Table 7-3. Proposed TMDL Numeric Targets for Dissolved Cadmium, Copper, and Zinc for a 25-Mile Segment of the Upper Sacramento River between Keswick Dam and Cottonwood Creek near Balls Ferry in Shasta County**

| Metals | Acute Numeric Target (μg/L) | Chronic Numeric Target (μg/L) |
|---|---|---|
| Cadmium | 0.22 | 0.22 |
| Copper | 5.6 | 4.1 |
| Zinc | 16 | 16 |

*Source: CVRWQCB 2002*

Key:
μg/L = micrograms per liter
TMDL = total maximum daily load

**Extended Study Area** The Sacramento River downstream from RBDD was listed as an impaired water body under Section 303(d) of the CWA. The parameters of concern in this reach included diazinon, mercury, and unknown sources of toxicity (CVRWQCB 2003b). TMDLs under development for the Sacramento River are for diazinon, methylmercury, and chlorpyrifos (CVRWQCB 2007b). The extended study area encompasses the San Francisco, Central Coast, Los Angeles, Lahontan, Colorado River Basin, Santa Ana, and San Diego RWQCBs.

#### *Clean Water Act Section 401 Water Quality Certification*

The CVRWQCB, under the auspices of the SWRCB, requires that a project proponent obtain a CWA Section 401 water quality certification in conjunction with the Section 404 permits granted by USACE. Because the project would have the potential to affect water quality in Shasta Lake, the CVRWQCB is likely to impose water quality limitations on the project through WDRs. Reclamation will prepare and submit to the CVRWQCB a request for water quality certification before development of the project. A likely condition of the water quality certification is preparation of an erosion and sedimentation control plan and a spill prevention and containment plan.

#### *Waste Discharge Permit*

The CVRWQCB controls the discharge of wastes to surface waters from industrial processes or construction activities through the NPDES permit process. WDRs are established in the permit to protect beneficial uses. The

CVRWQCB will require an application for a waste discharge permit for the project.

### *Industrial Stormwater General Permit*

The Industrial Stormwater General Permit (General Industrial Permit) is an NPDES permit that regulates discharges associated with 10 broad categories of industrial activities. This permit requires implementation of management measures that will achieve the performance standard of best available technology economically achievable and best conventional pollutant control technology. This permit also requires development of a SWPPP and a monitoring plan. Through the SWPPP, sources of pollutants are to be identified and the means to manage the sources to reduce stormwater pollution are described.

### *Stormwater Pollution Prevention Plan*

The General Industrial Permit includes provisions for developing a SWPPP to maximize the potential benefits of pollution prevention and sediment- and erosion-control measures at construction sites. Developing and implementing a SWPPP would provide Reclamation with the framework for reducing soil erosion and minimizing pollutants in stormwater during project construction.

### *Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California*

The *Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California* (Thermal Plan) sets limits for “thermal waste” and “elevated temperature waste” discharged into coastal and interstate waters and enclosed bays and estuaries of California (SWRCB no date). Estuarine waters are considered to extend from “…a bay or the open ocean to the upstream limit of tidal action” (SWRCB no date). This definition includes the Delta as defined by Section 12220 of the California Water Code, as well as portions of the Sacramento River that are subject to tidal action. Generally, the Basin Plan defines temperature objectives in two parts (CVRWQCB 2009):

> *At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5°F above natural receiving water temperature.*
>
> *The temperature shall not be elevated above 56°F in the reach from Keswick Dam to Hamilton City nor above 68°F in the reach from Hamilton City to the I Street Bridge during periods when temperature increases will be detrimental to the fishery.*

The first water quality standards for the Delta were adopted in May 1967, when the State Water Rights Board (predecessor to the SWRCB) released Water Right Decision 1275 (D-1275), approving water rights for the SWP while setting agricultural salinity standards as terms and conditions. Since then, these requirements were changed in 1971 under Water Right Decision 1379 (D-1379), and again in 1978 under Water Right Decision 1485 and the Water Quality Control Plan (WQCP) for the Delta and Suisun Marsh (1978 WQCP). In May 1995, SWRCB adopted a new Bay-Delta WQCP, and it was implemented through SWRCB Revised Water Rights Decision 1641 (D-1641) in March 2000.

#### *1995 Water Quality Control Plan*

The 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB 1995) established water quality control measures that contribute to the protection of beneficial uses in the Delta. The 1995 WQCP identified (1) beneficial uses of the Delta to be protected, (2) water quality objectives for the reasonable protection of beneficial uses, and (3) a program of implementation for achieving the water quality objectives. The 1995 WQCP superseded the *Water Quality Control Plan for Salinity* (adopted in May 1991) and the *Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh* that was adopted in August 1978.

The 1995 WQCP was developed as part of the December 15, 1994, Bay-Delta Accord, which committed the CVP and SWP to new Delta habitat objectives. Because these new beneficial objectives and water quality standards were more protective than those of the previous Water Right Decision 1485, the new objectives were adopted by amendment in 1995 through a Water Rights Order for operation of the CVP and SWP. One key feature of the 1995 WQCP was the estuarine habitat (“X2”) objectives for Suisun Bay and the western Delta. The X2 objective required specific daily or 14-day surface EC criteria, or 3-day averaged outflow requirements to be met for a certain number of days each month, February through June. These requirements were designed to provide improved shallow water habitat for fish species in spring. Because of the relationship between seawater intrusion and interior Delta water quality, the X2 criteria also improved water quality at Delta drinking water intakes. Other new elements of the 1995 WQCP included export-to-inflow ratios intended to reduce entrainment of fish at the export pumps, Delta Cross Channel gate closures, and San Joaquin River EC and flow standards.

#### *Water Right Decision 1641*

D-1641 and Water Rights Order 2001-05 contain the current water right requirements to implement the 1995 WQCP. D-1641 incorporates water right settlement agreements between Reclamation and DWR and certain water users in the Delta and upstream watersheds regarding contributions of flows to meet water quality objectives. However, Reclamation and/or DWR are responsible for ensuring that objectives are met in the Delta. D-1641 also authorizes the CVP and SWP to use joint points of diversion (JPOD) in the south Delta, and recognizes the CALFED Operations Coordination Group process for operational flexibility in applying or relaxing certain protective standards. The additional exports allowed under the JPOD could result in additional degradation of water quality for water users in the south and central Delta. The

JPOD also could affect water levels in the south Delta and endangered fish species.

In February 2006, SWRCB issued notice to Reclamation and DWR that each agency is responsible for meeting the objectives in the interior south Delta, as described in D-1641. The SWRCB order requires Reclamation and DWR to comply with a detailed plan and time schedule that will bring them into compliance with their respective permit and license requirements for meeting interior south Delta salinity objectives by July 1, 2009. The SWRCB order also revised the previously issued (July 1, 2005) Water Quality Response Plan approval governing Reclamation's and DWR's use of each other's respective point of diversion in the south Delta. Additionally, the order specifies that JPOD operations are authorized pursuant to the 1995 WQCP, and that Reclamation and DWR may conduct JPOD diversions, provided that both agencies are in compliance with all conditions of their respective water right permits and licenses at the time the JPOD diversions would occur (SWRCB 2006).

#### *Municipal and Industrial Water Quality Objectives*

In the 1978 WQCP, the SWRCB set two objectives that it believed would provide reasonable protection for M&I beneficial uses of Delta waters from the effects of salinity intrusion. The first objective established a year-round maximum mean daily chloride concentration measured at five Delta intake facilities, including CCWD's Pumping Plant Number 1, of 250 mg/L for the reasonable protection of municipal beneficial uses. This objective was consistent with the EPA secondary maximum contaminant level for chloride of 250 mg/L, and is based only on aesthetic (taste) considerations. The second objective established a maximum mean daily chloride concentration of 150 mg/L (measured at either CCWD Pumping Plant No. 1 or the San Joaquin River at the Antioch water works intake) for the reasonable protection of industrial beneficial uses (specifically manufacture of cardboard boxes by Gaylord Container Corporation in Antioch). This requirement is in effect for a minimum of between 155 and 240 days each calendar year, depending on the water year type.

In the 1991 WQCP, the SWRCB reviewed the water quality objectives for M&I use contained in the 1978 WQCP, and reviewed potential new objectives for trihalomethanes and other disinfection byproducts, including bromides. The SWRCB concluded that technical information regarding trihalomethanes and other disinfection byproducts was not sufficient to set a scientifically sound objective. Accordingly, the SWRCB continued the existing objectives for chloride concentration, and until development of more information about these constituents, set a water quality "goal" for bromides of 0.15 mg/L (150 micrograms per liter). The SWRCB also noted that the 150 mg/L chloride objective was maintained in part because it provides ancillary protection for other M&I uses in the absence of objectives for trihalomethanes and other disinfection byproducts.

These objectives remained unchanged in the 1995 WQCP. The SWRCB and CVRWQCB basin plans specify water quality objectives to protect designated beneficial uses, including municipal drinking-water supply. The CVRWQCB is also currently developing a Central Valley drinking-water policy that may lead to regulations limiting the discharge of bromide, organic carbon, pathogens, and other drinking water constituents of concern. The CVRWQCB took the important step of adopting resolutions in July 2004 (Resolution No. R5-2004-0091) and in July 2010 (Resolution No. R5-2010-0079) supporting development of the policy. Resolution No. R5-2010-0079 directed CVRWQCB staff to develop and bring a comprehensive drinking water policy to the board within 3 years (i.e., by 2013).

#### *Coordinated Operations Agreement*

The Coordinated Operations Agreement defines how Reclamation and DWR share their joint responsibility to meet Delta water quality standards and meet the water demands of senior water right holders. The Coordinated Operations Agreement defines the Delta as being in either “balanced water conditions” or “excess water conditions.” Balanced conditions are periods when Delta inflows are just sufficient to meet water user demands within the Delta, outflow requirements for water quality and flow standards, and export demands. Under excess conditions, Delta outflow exceeds the flow required to meet the water quality and flow standards. Typically, the Delta is in balanced water conditions from June to November, and in excess water conditions from December through May. However, depending on the volume and timing of winter runoff, excess or balanced conditions may extend throughout the year.

During excess water conditions, but during periods when Delta outflow is still relatively low, additional Delta diversions can degrade the water quality needed to meet drinking water standards, even when SWRCB M&I objectives are being met.

### 7.2.3 Local

The primary study area is located within both Shasta and Tehama counties, while the extended study area includes the following counties: Glenn, Butte, Colusa, Sutter, Yolo, Yuba, Sacramento, Napa, Solano, San Francisco, Contra Costa, San Joaquin, Alameda, Santa Clara, Stanislaus, Santa Cruz, San Benito, Merced, Madera, Fresno, Tulare, King, Kern, Santa Barbara, Ventura, Los Angeles, San Bernardino, Orange, Riverside, San Diego, and Imperial. Each of these counties has a general plan that includes general policies to protect water quality, water supply, water resources, and watersheds. There are no specific local requirements that are pertinent to this analysis.

Water quality protection measures are included in the *Shasta County General Plan*. The county’s goal is to protect all aspects of water quality in the county. The county defines erosion and downstream sedimentation as geologic hazards that must be prevented as part of grading and site development. The Shasta County Grading Ordinance sets requirements for grading and erosion control, including prevention of sedimentation or damage to off-site property. Grading permits require a vested map and the following information:

- A detailed grading plan
- Geological studies, if the project is located within an area that is prone to slippage, or has highly erodible soils or known geologic hazards
- Detailed drainage or flood control information as required by the Department of Public Works
- A final development plan, if the project is located in a zone or district that requires a final development plan
- A noise analysis, if the project is located in the vicinity of a high-noise-generating use

The water quality protection goal included in the Open Space and Conservation Element of the *Tehama County General Plan* (Tehama County 2009) is to ensure that water supplies are of sufficient quality and quality, now and into the future, to serve the needs of Tehama County (Goal OS-1). Policies in support of this goal include sound watershed management, protection of surface water quality and streamflows, and protection of groundwater quality through the minimization of erosion and prevention of intrusion of wastes into water supplies.

## 7.3 Environmental Consequences and Mitigation Measures

### 7.3.1 Methods and Assumptions

A combination of water quality monitoring data and computer modeling was used to aid in the evaluation of potential impacts of the project alternatives on water quality. Anticipated construction practices and materials, location, and duration of construction were also evaluated.

To evaluate potential Delta water quality impacts, the analysis relied on quantitative modeling tools to simulate conditions that would be expected to occur under the SLWRI alternatives compared to the bases of comparison (existing conditions without project, and future conditions without project). The analysis of potential impacts on water quality in the Delta includes an analysis of potential impacts on water quality for all in-Delta water users. Delta parameters used in the evaluation include simulated changes in X2 location, Delta outflow, export-to-inflow ratio, salinity, and chloride ion concentrations.

The water quality impact assessment focuses on EC, measured in millimhos per centimeter (mmhos/cm), and chloride ion concentration in mg/L, as indicators of Delta water quality because they are the primary water quality constituents most likely to be affected by changes in Delta outflow and pumping operations. EC also is the parameter for which considerable monitoring data are available, and which has been used to calibrate the modeling tools used to simulate Delta water quality conditions.

A suite of modeling tools was used to evaluate the potential impacts of existing conditions, and the No-Action and other SLWRI alternatives on the Delta water quality of the project, and to quantify potential benefits. CalSim-II was used to simulate CVP and SWP operations, determining surface water flows, storages, and deliveries associated with each alternative. (A detailed description of CalSim-II is included in Chapter 2 of the Modeling Appendix.) Delta Simulation Model 2 (DSM2) was used to simulate the hydrodynamics of the Delta, providing the data used in discussion of the water-quality-related impacts of each alternative. (A detailed description of DSM2 and the assumptions used in the SLWRI analysis are included in Chapter 8 of the Modeling Appendix.) Summaries of the analysis and modeling results are provided below. (More detailed results of the CalSim-II output can be found in Attachment A of the *Hydrology, Hydraulics, and Water Management Technical Report*.) Attachment A of the *Water Quality Technical Report* contains more detailed DSM2 output.

To understand the effects of the alternatives under both existing and future conditions, each alternative was modeled using two different assumptions about level of development (2005 and 2030) and compared to the appropriate baseline modeling results to determine the character and extent of impacts.

#### *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 relating to CVP/SWP operations. The primary purpose of CalSim-II is to evaluate the water supply reliability of the CVP and SWP at current or future levels of development (e.g., 2005, 2030), with and without various assumed future facilities, and with different modes of facility operations. Geographically, the model covers the drainage basin of the Delta, and CVP/SWP exports to the Bay Area, San Joaquin Valley, Central Coast, and Southern California.

CalSim-II typically simulates system operations for an 83-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, 2030). The historical flow record of 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.

CalSim-II models a complex and extensive set of regulatory standards and operations criteria. (Descriptions of both are contained in Chapter 2 of the Modeling Appendix.) The hydrologic analysis presented for this EIS used the Common Assumptions Common Modeling Package version 8D CalSim-II models, which are the best available hydrological modeling tools, to approximate the changes in storage, flow, salinity, and reservoir system reoperation associated with the SLWRI alternatives. Although CalSim-II is the best available tool for simulating system-wide operations, the model also contains simplifying assumptions in its representation of the real system.

A general external review of the methodology, software, and applications of CalSim-II was conducted in 2003 (Close et al. 2003). Recently, an external review of the San Joaquin River Valley CalSim-II model was also conducted (Ford et al. 2006). Several limitations of the CalSim-II models were identified in these external reviews. The main limitations of the CalSim-II models are as follows:

- Model uses a monthly time step
- Accuracy of the inflow hydrology is uncertain:
  - Model lacks a fully explicit groundwater representation

Reclamation, DWR, and the external reviewers have identified the need for a comprehensive error and uncertainty analysis for various aspects of the CalSim-II model. DWR has issued a CalSim-II Model Sensitivity Analysis Study (DWR 2005), and Reclamation is currently embarking on a similar sensitivity and uncertainty analysis for the San Joaquin River basin. This information will improve understanding of the model results.

Despite these limitations, the monthly CalSim-II model results remain useful 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 and errors or assumptions in formulation, system representation, data, operational criteria, etc., all contribute to total error or uncertainty in model results. In “comparative” applications, the model is run twice, once to represent a base condition (no-project) and a second time with a specific change (project) to assess the change in the outcome because of the input change. In this 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. The SLWRI analysis is a comparative analysis.

#### ***DSM2***

DSM2 is a branched 1-dimensional model for simulation of hydrodynamics, water quality, and particle tracking in a network of riverine or estuarine channels (DWR 2002). The hydrodynamic module can simulate channel stage, flow, and water velocity. The water quality module can simulate the movement of both conservative and nonconservative constituents. The model is used by DWR to perform operational and planning studies of the Delta.

Impact analyses for planning studies of the Delta are typically performed for a 72-year period (1922 to 1994). In model simulations, EC is typically used as a surrogate for salinity. Results from CalSim-II are used to define Delta boundary inflows. CalSim-II-derived boundary inflows include the Sacramento River flow at Hood, San Joaquin River flow at Vernalis, inflow from the Yolo Bypass, and inflow from the eastside streams. In addition, Net Delta Outflow from CalSim-II is used to calculate the salinity boundary at Martinez.

Details of the model, including source codes and model performance, are available from the DWR Bay-Delta Office, Modeling Support Branch Web site (http://modeling.water.ca.gov/delta/models/dsm2/index.html). Documentation on model development is discussed in annual reports on Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh submitted to the SWRCB by the DWR Delta Modeling Section.

#### *Sediment*

The potential impacts from sediment in terms of erosion and geomorphology are analyzed in Chapter 4, "Geology, Geomorphology, Minerals, and Soils."

#### *Temperature*

The analysis presented in Chapter 6, "Hydrology, Hydraulics, and Water Management," assumed that the SLWRI alternatives would not alter existing operational rules or protocols and that there would be no formal changes to CVP or SWP operating criteria. Each action alternative would include storing some additional flows behind Shasta Dam during periods when the flows would have otherwise been released downstream. The resulting increase in storage would be used both to create an expanded cold-water pool (CWP), thus benefiting fisheries, and for subsequent release downstream when there are opportunities to put the water to beneficial use.

HEC-5Q temperature modeling was used to simulate flow and temperature for the Sacramento River system above RBDD. This model was updated to better represent the upper Sacramento River system with an emphasis on operation of the Shasta TCD. CalSim-II results were used as flow inputs to the HEC-5Q model. Temperature results are presented in Chapter 11, "Fisheries and Aquatic Ecosystems." The water quality impacts analysis for temperature based on those results is summarized below.

#### *Metals*

Water quality data available for Shasta Lake and its tributaries were used to assess the impacts related to the discharge of metals into Shasta Lake. Available monitoring data for the Sacramento River were used to assess the impacts of metals in Keswick Reservoir and the Sacramento River downstream.

### 7.3.2 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 environmental impact statement 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)).

#### *Overall Impact Indicators for Water Quality*

The significance criteria described below were developed based on guidance provided by the State CEQA Guidelines for use in assessing potential impacts on water quality; they also consider the context and intensity of the environmental effects as required under NEPA. These significance criteria were applied to the qualitative assessment and quantitative modeling results and used to determine impact significance. The analysis of water quality impacts and benefits focuses on temperature, metals, and sediment, because they are important water quality constituents in the both the primary and extended study areas.

The impact significance criteria for Delta water quality variables that have regulatory objectives or numerical standards, such as those contained in the 1995 WQCP, are developed from the general considerations listed below.

Impacts of an alternative on water quality would be significant if project implementation would do any of the following:

- Violate existing water quality standards or otherwise substantially degrade water quality
- Result in substantial water quality changes that would adversely affect beneficial uses
- Result in substantive undesirable impacts on public health or environmental receptors

Significance statements are relative to both existing conditions (2005) and future conditions (2030) unless stated otherwise.

### *Impact Indicators for Delta Salinity*

If changes in salinity within the Delta during months of increased pumping would result in an increase in salinity, relative to the basis of comparison, of sufficient frequency and magnitude over the long term to adversely affect designated beneficial uses, to increase the frequency that existing regulatory standards are exceeded, or to substantially degrade water quality at the locations below, then the impact would be considered significant:

- Sacramento River at Collinsville
- San Joaquin River at Jersey Point
- Sacramento River at Emmaton
- Old River at Rock Slough
- Delta-Mendota Canal at Jones Pumping Plant
- West Canal at mouth of the Clifton Court Forebay
- San Joaquin River at Vernalis
- Old River near Tracy Road Bridge
- Old River at Middle River
- San Joaquin River at Brandt Bridge

Figure 7-3 shows the major Delta islands, waterways, water quality control stations, and M&I intakes within the Delta.

**Salinity** Salinity-related water quality impacts associated with the operational component of the SLWRI alternatives were assessed at several locations in the Delta. EC was used as a surrogate for salinity. Using the assumptions discussed above, and detailed in Chapter 6 of the Modeling Appendix, the DSM2 model calculated changes in monthly mean EC values for the alternatives, relative to the bases of comparison. Monthly EC results were derived for a 73-year simulation period, extending from 1922 through 1994.

DSM2 model output was used to evaluate potential changes in salinity under the SWLRI alternatives, relative to the bases of comparison: changes equal to or greater than 5 percent in long-term monthly average EC values and average monthly EC values by water year type, and compliance with water quality standards, including the number of occurrences during which an EC compliance standard was met or exceeded.


| Node ID | Description |
|---|---|
| 1 | Sacramento River at Rio Vista |
| 2 | Sacramento River at Emmaton |
| 3 | Sacramento River at Collinsville |
| 4 | Sacramento River at Chipps Island |
| 5 | Sacramento River at Port Chicago (Roe Island) |
| 6 | Old River near Middle River |
| 7 | Old River at Tracy Road Bridge |
| 8 | Delta Mendota Canal at Tracy Pumping Plant |
| 9 | West Canal at mouth of Clifton Court Forebay Intake |
| 10 | Old River at CCWD Los Vaqueros Intake |
| 11 | CCWD Proposed Alternative Intake |
| 12 | Middle River east of Victoria Island |
| 13 | Woodward Canal |
| 14 | Old River at Rock Slough |
| 15 | Contra Costa Canal at Pumping Plant #1 |
| 16 | San Joaquin River near Vernalis |
| 17 | San Joaquin River at Brandt Bridge |
| 18 | San Joaquin River downstream of Calaveras River |
| 19 | Stockton Proposed Intake |
| 20 | San Joaquin River at Prisoners Point |
| 21 | San Joaquin River at San Andreas Landing |
| 22 | San Joaquin River at Jersey Point |
| 23 | San Joaquin River at Antioch Ship Channel |
| 24 | Mokelumne River at Terminous |
| 25 | Barker Slough at North Bay Aqueduct Intake |
| 26 | Head of Old River Barrier |
| 27 | Middle River Barrier |
| 28 | Grant Line Canal Barrier |
| 29 | Old River Barrier at Tracy Road Bridge |

**Figure 7-3. Major Delta Islands, Waterways, Water Quality Control Stations, and Municipal and Industrial Intakes**

Changes in salinity were evaluated in the Delta during months of increased pumping under the alternatives, relative to the bases of comparison. Potential significant impacts could occur if salinity increases were of sufficient frequency and magnitude over the long term to adversely affect designated beneficial uses, to exceed existing regulatory standards, or to substantially degrade water quality.

Delta water quality is directly controlled by existing Delta water quality objectives (SWRCB 1995) for M&I, agricultural, and fish and wildlife uses that are incorporated in SWRCB D-1641 (SWRCB 2000). The 1995 WQCP objectives vary with month and water year type. Also, the 1995 WQCP objectives may only apply for some months and at some locations.

Applicable EC objectives were evaluated for the agricultural diversion season of April through August at Emmaton and Jersey Point, and during the entire year at each of the CVP/SWP export locations, and three south Delta locations. Increases in EC values that result in exceedence of the objective at specified locations in the Delta were considered to be significant water quality impacts. Monthly changes in EC values are also considered to be significant if they exceeded 10 percent of the applicable objective.

#### *Impact Indicators for X2 Position*

If a change in mean monthly position of X2, relative to the bases of comparison, would be of sufficient frequency and magnitude to adversely affect water quality, then it shall be considered a significant impact.

The X2 parameter represents the geographical location of the 2 parts per thousand near-bottom salinity isohaline in the Delta, which is measured in distance upstream from the Golden Gate Bridge in Suisun Bay (Jassby et al. 1995). The location of the estuarine salinity gradient is regulated during the months of February through June by the location of the X2 objective in the 1995 WQCP. During this time period, the X2 location must remain downstream from the confluence of the Sacramento and San Joaquin rivers[1] at Collinsville for the entire 5-month period. The X2 objective also specifies the number of days each month that that location of X2 must be downstream from Chipps Island or downstream from Roe Island.[2]

Estuarine EC objectives (i.e., X2) specified in the 1995 WQCP are applicable at Chipps Island during February through June for most years. The maximum EC objective at Chipps Island is 2.640 mmhos/cm (corresponding to a 2 parts per thousand salinity at Chipps Island) and must be satisfied for a specified number of days each month, depending on the previous month's Eight River Index (a measure of runoff in the Sacramento and San Joaquin valleys).

[1] Also referred to as Collinsville.
[2] Also referred to as the Port Chicago EC monitoring station.

### 7.3.3 Topics Eliminated from Further Consideration

The comprehensive plans include measures to remove or abandon on-site wastewater treatment facilities (e.g., septic tanks and/or drain fields) in conjunction with relocation activities. Several wastewater treatment packages will be developed to ensure that management of effluent from lakeshore developments is consistent with requirements of Federal, State, and local agencies. Only minor project-related effects on nutrients are expected to occur in either the primary study area or the extended study area; therefore, potential effects on the study area related to nutrients are not discussed further in this EIS.

### 7.3.4 Direct and Indirect Effects

#### *No-Action Alternative*

**Shasta Lake and Vicinity** Under the No-Action Alternative, the full-pool elevation of Shasta Lake would not be increased, and no ground-disturbing activities associated with construction would occur. Therefore, there would be no short-term increases in turbidity and suspended sediment in Shasta Lake and tributary streams. Ongoing impacts of sediment on beneficial uses would remain consistent with those that occur periodically under baseline conditions.

Under the No-Action Alternative, the operation of Shasta Dam would continue to influence the amount and duration of exposed shoreline below the maximum elevation of the reservoir. As described in Chapter 4, “Geology, Geomorphology, Minerals, and Soils,” the shoreline would continue to erode, and impacts to beneficial uses, namely recreation and to some extent, the warm-water fishery along the shoreline of Shasta Lake, would be ongoing. In addition to active areas of shoreline erosion, sediment would continue to periodically be transported into Shasta Lake from tributaries as a result of other ongoing actions within the project area. Wave action and nearshore currents would continue to remobilize sediment that is typically visible as turbid plumes of water along portions of the shoreline. Sediment and turbidity would remain consistent with baseline conditions.

Reclamation operates the Shasta Dam TCD to manage water temperatures in the upper Sacramento River to (1) improve habitat for the endangered winter-run Chinook salmon and other threatened runs; (2) withdraw warmer surface water in the winter and spring to preserve cold-water storage for release during the temperature operation season; and (3) enable power generation to continue while controlling release temperatures, thereby eliminating the need to bypass the power plant penstocks via the low-level river outlets. Generally, to accomplish these temperature objectives during the temperature operation season, the TCD functions to select water temperatures in the 47˚F to 52˚F range. Therefore, a good index of the temperature-related benefits of the alternative is the volume of the CWP with a water temperature lower than 52˚F at the end of April.

In the context of historical project operation, reservoir storage and CWP conditions in mid-spring represent the available cold-water “bank” managed throughout the temperature operation season (July through October), as prescribed by Reclamation and implemented by Central Valley Operations.

Under the No-Action Alternative, no new facilities associated with raising Shasta Dam would be constructed within the vicinity of Shasta Lake; therefore, there would be no short-term changes in the temperature regime of waters within Shasta Lake or its tributaries.

Under the No-Action Alternative, Shasta Dam would continue to be operated consistent with current regulatory requirements with respect to storage and release of water to the upper Sacramento River. As described in Chapter 6, “Hydrology, Hydraulics, and Water Management,” the temperature profile within Shasta Lake would not be changed under the No-Action Alternative. Therefore, there would be no change in the temperature regime of waters within Shasta Lake or its tributaries. Periodic changes in water temperature on a seasonal or interannual basis would be consistent with those that occur under baseline conditions.

Under the No-Action Alternative, no new facilities associated with raising Shasta Dam would be constructed in the vicinity of Shasta Lake. Metal concentrations in the Main Body and the Squaw Creek Arm would continue to be within the range of variability that currently exists with respect to the ongoing discharge and potential storage of heavy metals associated with historic mining and smelting operations. Concentrations of metals, specifically copper and zinc, that may persist within the water column of Shasta Lake would continue to remain in suspension at locations and levels similar to baseline conditions. Ongoing remediation of historic mining properties at locations in the Dry Creek, Little Backbone, Squaw Creek, and Horse Creek watersheds are anticipated to reduce the amount of acid mine drainage into Shasta Lake over time, thereby reducing metal concentrations in the water column.

**Upper Sacramento River (Shasta Dam to Red Bluff)** Under the No-Action Alternative, no new facilities would be constructed at Shasta Lake; thus there would be no construction-related degradation of water quality. In addition, there would be no changes in releases at Shasta or other CVP reservoirs as a result of a Shasta Lake enlargement that would either adversely affect or improve water quality. It is anticipated that if the project alternatives were not implemented, current operations to meet existing regulatory requirements would be continued. The ability to comply with existing temperature requirements would not be improved. Analysis of flow and temperature modeling results indicates little change in flows or compliance with temperature objectives on the upper Sacramento River between existing conditions and the future No-Action Alternative conditions. Remediation activities at Iron Mountain Mine and other mine sites over the last several years, as well as dredging of contaminated sediment in the Spring Creek Arm of Keswick Reservoir in 2009 and 2010, would be expected to maintain or reduce the likelihood of future exceedences of the TMDL numeric targets below Keswick Dam. Therefore, there would be no impacts on water quality in the primary study area associated with the No-Action Alternative.

**Lower Sacramento River and Delta and CVP/SWP Service Areas** Under the No-Action Alternative, Shasta Dam would not be modified, and the CVP and SWP would continue operating similarly to existing conditions. Changes in regulatory conditions and water supply demands would result in differences in flows on the Sacramento River and the Delta. However, the No-Action Alternative would not, in itself, result in any changes in Delta water quality. Modeling indicates that the No-Action Alternative would continue to meet water quality requirements at levels of compliance similar to existing conditions, and would not result in any appreciable degradation of water quality.

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

CP1 focuses on increasing water supply reliability while contributing to increased survival of anadromous fish. Seven measures are included, to some degree, in all of the comprehensive plans:

- Enlarge Shasta Lake's cold-water pool
- Modify the TCD
- Increase conservation storage
- Reduce demand
- Modify flood control operations
- Increase public safety at Shasta Dam
- Modify hydropower facilities

In addition to these common features, CP1 consists primarily of raising Shasta Dam 6.5 feet, an elevation change that would increase the reservoir's full pool elevation by 8.5 feet and would enlarge the total storage space in the reservoir by 256 thousand acre-feet (TAF). Under this plan, operational guidelines for Shasta Dam would continue unchanged, with the additional storage retained for water supply reliability. This scenario would help to reduce future water shortages by increasing the reliability of the water supply in drought and average years. The increased pool depth and volume would also contribute to maintaining lower seasonal water temperatures for anadromous fish on the upper Sacramento River.

**Shasta Lake and Vicinity**

*Impact WQ-1 (CP1): Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* The construction-related activities described in Chapter 2, "Alternatives," would result in short-term changes in the amount of exposed area that would be subject to erosion. In addition to the clearing of vegetation in various areas to accommodate relocation activities, about 500 acres of vegetation in parts of the new inundation area would be cleared. Removal of vegetation would reduce the amount of effective ground cover (e.g., duff, large woody debris), thereby increasing the potential for short-term erosion and sedimentation along the shoreline.

The relocation activities would result in exposing as many as 3,337 acres to some amount of soil disturbance. These effects are described in more detail in Chapter 4, "Geology, Geomorphology, Minerals, and Soils." The disturbed sites would have the potential to contribute sediments to nearby water bodies.

Although the environmental protection measures and BMPs described in Chapter 2, "Alternatives." are intended to reduce the potential effects of introducing sediment into Shasta Lake and its tributaries, CP1 would affect water quality by increasing the levels of turbidity and suspended sediment in the receiving waters at levels that could be inconsistent with the Basin Plan. These increased levels of turbidity and suspended sediment could affect the beneficial uses of Shasta Lake and/or its tributaries. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-2 (CP1): Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Under CP1, construction activities associated with enlarging Shasta Dam as well as the relocation actions would result in sizeable areas that would be subject to surface disturbance, including jurisdictional waters within the influence zone of this alternative. Efforts to document jurisdictional waters associated with relocation areas are ongoing. This information will be included if available in the Final EIS, as well as in the Section 404 permitting package, prior to issuance of a ROD.

Environmental commitments and BMPs for the various construction and relocation activities (e.g., bridge replacement, boat ramp construction, demolition of facilities) have been incorporated into CP1. These activities could include removal of riparian vegetation, thereby exposing water bodies to increased solar radiation for various time periods. As described in Chapter 2, "Alternatives," a riparian revegetation program would be implemented at all construction and relocation sites as applicable to ensure that shade is quickly reestablished after construction is completed.

As described in Chapter 2, "Alternatives," although the TCD may not be operational for some period of time during construction, project sequencing would ensure that changes to water temperature and associated limnological conditions would be consistent with those that occur periodically under the No-Action Alternative associated with maintenance and outage periods.

Because of the large water surface area of Shasta Lake, coupled with the isolated and discrete nature of the relocation activities on the tributaries, temporary construction-related effects are not expected to modify water temperature in a manner that would have a negative effect on beneficial uses or result in a water quality violation. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-3 (CP1): Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Under CP1, there would be no construction activities that would disturb locations known to contain elevated metal concentrations in either sediments or the water column. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-4 (CP1): Long-Term Sediment Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Under CP1, the exposure of an additional 1,227 acres of shoreline surrounding Shasta Lake would result in a potential for increased wave-related shoreline erosion (see Chapter 4, “Geology, Geomorphology, Minerals, and Soils”). As the reservoir is lowered during summer and fall, the exposed surface area would also be subject to surficial erosion processes that could mobilize and transport sediment to the newly expanded Shasta Lake. Although environmental commitments and BMPs are incorporated into the project description, the project would result in an incremental increase in the delivery of suspended sediment and turbidity to the receiving waters. The amount of sediment that could be delivered is not quantifiable because of the size of the lake and the number of variables that influence sediment transport and delivery. This impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-5 (CP1): Long-Term Temperature Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* The analysis presented in Chapter 6, “Hydrology, Hydraulics, and Water Management,” assumed that the existing CVP or SWP operating criteria would not be changed from an annual perspective and that the action alternatives would increase storage on a monthly basis. Reductions in releases would typically occur during winter (November through March) in relatively wet years, and increases in releases would typically occur in the late spring and summer (June through September) of drier years. CP1 would store some additional flows behind Shasta Dam during periods when the flows would have otherwise been released downstream. The resulting increase in storage would then be used both to create an expanded CWP available for carryover storage, thus benefiting fisheries, and for subsequent release to support beneficial uses downstream. On average, CP1 would provide about a 5 percent increase in annual storage.

Table 7-4 shows the simulated monthly change in storage for CP1 as a percent increase above the No-Action Alternative.

**Table 7-4. Simulated Average End-of-Month Shasta Lake Storage – CP1**

| Month | Existing Condition (TAF) | CP1 (TAF) | CP1 % Increase |
|---|---|---|---|
| Oct | 2,671 | 144 | 5.4% |
| Nov | 2,690 | 148 | 5.5% |
| Dec | 2,815 | 160 | 5.4% |
| Jan | 3,067 | 165 | 5.4% |
| Feb | 3,291 | 175 | 5.3% |
| Mar | 3,624 | 175 | 4.8% |
| Apr | 3,919 | 170 | 4.3% |
| May | 3,950 | 171 | 4.3% |
| Jun | 3,642 | 169 | 4.6% |
| Jul | 3,187 | 162 | 5.1% |
| Aug | 2,879 | 150 | 5.2% |
| Sep | 2,782 | 145 | 5.2% |

*Source: Common Assumptions Common Modeling Package Version 8D CalSim-II 2005 and 2030 simulations (Node S4+S44)*
Note:
Simulation period: 1922-2003
Key:
TAF = thousand acre-feet

Under CP1, existing water temperature requirements would typically be met in most years; therefore, the additional increase in water storage shown in Table 7-4 would primarily be released for water supply purposes. Accordingly, minimal increases in releases from Shasta Dam would be expected in months when Delta exports are constrained, or when flow is not usable for water supply purposes.

As illustrated in Table 7-4, the increase in storage provided by CP1 fluctuates greatly throughout a year; storage is typically highest at the end of winter, in April and May, as the need for flood control reservation space in the reservoir is reduced. Storage is typically at its lowest in September and October, after the irrigation season and before the winter refill begins. This additional storage would typically be greatest in winter (February or March), and would be lowest at the end of summer (September or October), which is consistent with Shasta Reservoir's current operation. Additional runoff captured by the increased storage increment would typically remain in storage and available to support beneficial uses downstream. Conversely, if there were insufficient water in storage to meet downstream demands, the first increment to be reduced would be deliveries to water service contractors. As such, increased releases would typically be made on a schedule providing increased reliability of deliveries to water service contractors, typically in July through October of relatively dry years.

A key indicator of the water temperature benefits of CP1 to the upper Sacramento River between Keswick Dam and Red Bluff is the amount of cold water available in Shasta Lake prior to the water temperature operation season, about May through October. As previously described, Shasta Lake generally reaches its maximum storage during late April or early May. Also, the CWP volume in the lake accumulates during winter and early spring and is not likely to increase after April. Therefore, the expected increase in spring storage for CP1 should also result in an incremental increase in the CWP volume.

The simulated end-of-April volume of water with a temperature lower than 52˚F for the No-Action Alternative and the change in CWP volume for CP1 is shown, by Sacramento Valley Index (SVI) year type, in Table 7-5.

In addition to illustrating the average change in available CWP, Table 7-5 also shows the influence of climatic conditions on these values. The diversity between water year types, coupled with unique combinations of storage and rainfall, would continue to influence the ability to manage storage in Shasta Lake to maximize carryover capacity. Although there would be a meaningful increase in the active storage and carryover storage of the CWP, this increase is considered a less than significant impact. Mitigation for this impact is not needed, and thus not proposed.

**Table 7-5. Simulated Average Volume of Water Less than 52˚F in Shasta Lake at the End of April – CP1**

| SVI Year Type | Existing Condition (TAF) | CP1 (TAF) | CP1 % Increase |
|---|---|---|---|
| Average of All Years | 1,577 | 90 | 5.7% |
| Wet | 1,807 | 137 | 7.6% |
| Above Normal | 1,721 | 110 | 6.4% |
| Below Normal | 1,743 | 72 | 4.1% |
| Dry | 1,451 | 71 | 4.9% |
| Critical | 928 | 16 | 1.7% |

*Source: Common Assumptions Common Modeling Package Version 8D SRWQM 2005 and 2030 simulations.*
Notes:
Simulation period: 1922–2003
Year types as defined by the Sacramento Valley Index
Key:
SVI = Sacramento Valley Index
TAF = thousand acre-feet

*Impact WQ-6 (CP1): Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* The increase in storage associated with CP1 would result in modifying the depth and thickness of the thermocline in Shasta Lake. The level of change would be correlated to a number of parameters, including carryover storage, climatic conditions, and the timing and duration of stratification (Bartholow et al. 2001). A study conducted by the CVRWQCB in 2002 and 2003 suggests that there is a direct correlation between dissolved copper concentrations in the upper levels of Shasta Lake near the dam and dissolved copper concentrations in the waters immediately downstream from the power plant (CVRWQCB 2003a). This study concluded that there appears to be a correlation between operation of the TCD and concentration of dissolved metals within the thermocline; an increase in available storage, however, would increase the opportunity to dilute metals concentrations below current levels.

Within the Squaw Creek Arm, two depositional features associated with historic copper mining and smelting operations are immediately adjacent to the shoreline of Shasta Lake in the general vicinity of the Bully Hill Mine. As mapped, these two sites appear to have about 7,300 cubic yards of material that could be subjected to shoreline and surficial erosional processes, with a high potential for delivery to Shasta Lake. This impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Upper Sacramento River (Shasta Dam to Red Bluff)**

*Impact WQ-7 (CP1): Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction would include ground-disturbing activities that could result in soil erosion and sediment effects on the upper Sacramento River. This impact would be potentially significant.

As described in Impact WQ-1 (CP1), ground-disturbing activities associated with construction could cause soil erosion and sedimentation of local drainages and eventually the Sacramento River. Construction activities could also discharge waste petroleum products or other construction-related substances that could enter these waterways/facilities in runoff. The environmental protection measures and BMPs described in Chapter 2, “Alternatives,” are intended to reduce the potential effects of introducing sediment into Shasta Lake and into downstream releases to the upper Sacramento River; however, CP1 would affect water quality by increasing the levels of turbidity and suspended sediment in the receiving waters at levels that could be inconsistent with the Basin Plan. These increased levels of turbidity and suspended sediment could affect the beneficial uses of the upper Sacramento River. Therefore, this temporary impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-8 (CP1): Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Would Cause Violations of Water Quality*

*Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in temperature effects on the upper Sacramento River because changes to water temperature in Shasta Lake and subsequent releases to the Sacramento River would be consistent with typical periodic fluctuations. This impact would be less than significant.

As described for Impact WQ-2 (CP1), changes to water temperature and associated limnological conditions in Shasta Lake would be consistent with those that occur periodically under the No-Action Alternative associated with maintenance and outage periods. Therefore, water temperatures in the upper Sacramento River, which are related to releases from Shasta Lake, would not be expected to be modified during construction in a manner that would negatively affect beneficial uses or result in a water quality violation. This temporary impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-9 (CP1): Temporary Construction-Related Metal Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in water quality effects on the upper Sacramento River related to metals because construction would not disturb locations of known elevated metal concentrations. This impact would be less than significant.

As described in Impact WQ-3 (CP1), there would be no construction activities that would disturb locations known to contain elevated metal concentrations in either sediments or the water column of Shasta Lake. Because water quality in the upper Sacramento River is related to the quality of releases from Shasta Lake, metals concentrations would not be expected to be modified during construction in a manner that would negatively affect beneficial uses or result in a water quality violation. This temporary impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-10 (CP1): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* No long-term water quality impacts are anticipated in the upper Sacramento River in regard to sediment, because modeling results have indicated that CP1 would cause little change in average mean monthly flow, and could cause a decrease in peak flows that are associated with increased sediment transport. This impact would be less than significant.

Long-term effects on water quality could be caused by changes in the size and timing of releases from the reservoir associated with CP1. The analysis used flow data from hydrologic modeling as an indicator of effects on sediment and metals.

For CP1, fall and winter flows on the upper Sacramento River would be reduced in some years, and summer flows would increase in many years. In addition, retention of winter flows would reduce or eliminate some overbank flood events in the upper Sacramento River. Because the reservoir would be able to store additional water during high-flow periods, in some years wintertime peak flows would be reduced as a result of the project. High-flow events transport sediments and can produce bank erosion and meander.

The Basin Plan specifies that changes to suspended sediment loading and discharge rates cannot cause nuisance or adversely affect beneficial uses (CVRWQCB 2007b). Under both existing and future conditions, analysis of modeling results indicates that the generally small changes in average mean monthly flow from CP1 are unlikely to have a significant effect on sediment transport within the upper Sacramento River. In addition, it appears that CP1 would reduce wintertime peak flow events, which may reduce sediment loading and discharge rates. Beneficial uses that may be beneficially affected include municipal and domestic supply, irrigation and stock watering, service supply, power, contact recreation and canoeing and rafting, other noncontact recreation, and navigation. However, there could be varying effects on beneficial uses concerning habitat, such as freshwater and spawning habitat. These impacts are explored further in Chapter 11, "Aquatic and Fisheries Ecosystems,". Because the project would cause little change in average mean monthly flow, and a potential decrease in peak flows, the water quality impact of CP1 related to sediment would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-11 (CP1): Long-Term Temperature Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Analysis of temperature modeling results indicates that CP1 would improve compliance with the temperature requirements on the Sacramento River because of the increased depth of the cold-water pool in Shasta Lake and the associated enhanced ability to regulate water temperature releases to the upper Sacramento River. Therefore, the impact of CP1 on water quality measured as temperature would be beneficial.

The temperature analysis used temperature modeling; the analysis was limited to using monthly average flows by the modeling tools used. CP1 would increase the ability of Shasta Dam to release cold water and regulate water temperature in the upper Sacramento River, primarily in dry and critically dry years. This would be accomplished by raising Shasta Dam 6.5 feet, thus increasing the depth of the cold-water pool in Shasta Lake and resulting in an increase in seasonal cold-water volume below the thermocline (i.e., layer of greatest water temperature and density change). Cold water released from Shasta Dam influences water temperature conditions in the Sacramento River between Keswick Dam and RBDD, with effects diminishing downstream.

This section focuses on compliance with water quality standards for temperature. For an analysis of temperature effects on fisheries and aquatic habitat, see Chapter 11, "Fisheries and Aquatic Resources."

Analysis of temperature modeling results indicates that CP1 would improve compliance with the temperature requirements on the Sacramento River. The 2009 BO for CVP and SWP operations and their effects on the Sacramento River winter-run Chinook salmon require that Sacramento River water temperatures be below 56°F at compliance locations between Balls Ferry and Bend Bridge from April 15 through September 30, and not in excess of 60°F at the same compliance locations in during October. Currently, this standard is not always met, particularly in dry and critically dry years. CP1 would reduce the amount of daily exceedences of the 2009 BO standards under both existing and future conditions. Table 7-6 provides a summary of modeled reductions in exceedences over the 82-year modeling period under each of the alternatives.

Based on this analysis, the impact of CP1 on water quality measured as temperature would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-12 (CP1): Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Long-term operation of the project could result in water quality effects on the upper Sacramento River in regard to metals as a result of erosional processes to historic mining and smelting operation features. This impact would be potentially significant.

**Table 7-6. Modeled Reduction in Daily Exceedences of Sacramento River Temperature Requirements (as Defined by the 2004 Biological Opinion for CVP and SWP Operations and Their Effects on the Sacramento River Winter-Run Chinook Salmon) for April 1 – October 31**

| Comprehensive Plan | Existing Conditions (2005) | | Future Conditions (2030) | |
|---|---|---|---|---|
| | Balls Ferry | Bend Bridge | Balls Ferry | Bend Bridge |
| CP1 | 10% | 4% | 14% | 5% |
| CP2 | 15% | 6% | 19% | 8% |
| CP3 and CP5 | 18% | 8% | 24% | 11% |
| CP4 | 37% | 13% | 40% | 15% |

*Source: Common Assumptions Common Modeling Package Version 8D SRWQM 2005 and 2030 simulations*

Note:
Simulation period: 1922–2003
Source: Data provided by MWH in 2007

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

The analysis used flow data from hydrologic modeling as an indicator of effects on sediment and metals. The Sacramento River and its tributaries upstream from Keswick Dam are the primary source of metals to the lower Sacramento River (USGS 2000b). Shasta Lake is also listed as impaired for metals. As described in Impact WQ-6 (CP1), a study conducted by the CVRWQCB in 2002 and 2003 suggests that there is a direct correlation between dissolved copper concentrations in the upper levels of Shasta Lake near the dam and dissolved copper concentrations in the waters immediately downstream from the power plant (CVRWQCB 2003a).

The 25-mile reach of the Sacramento River from Keswick Dam downstream to Cottonwood Creek is impaired for cadmium, copper, and zinc. The CVRWQCB developed a TMDL program for these constituents in the upper Sacramento River because of exceedences of water quality standards. Heavy metals such as copper, zinc, mercury, lead, and cadmium are water quality parameters that are impairing beneficial uses. Natural mineral deposits and historical mining practices are a source of metals, including mercury, within Shasta Lake and the upper Sacramento River. High metals concentrations in the Sacramento River correlate with concentrations of suspended sediment and high flows because metals are transported adsorbed to suspended sediments (USGS 2000b; Domagalski et al. 2000).

Under both existing and future conditions, the generally small changes in average mean monthly flow from the project predicted by modeling are unlikely to have a significant effect on metals within the upper Sacramento River and would not be expected to result in exceedences of the dissolved metals numeric targets established in the TMDL (as shown in Table 7-3). Remediation activities at Iron Mountain Mine and other mine sites over the last several years, as well as dredging of contaminated sediment in the Spring Creek Arm of Keswick Reservoir in 2009 to 2010, are also expected to reduce the likelihood of future exceedences of the TMDL numeric targets below Keswick Dam.

However, as described in Impact WQ-6 (CP1), two depositional features associated with historic copper mining and smelting operation within the Squaw Creek Arm of Shasta Lake could be subjected to shoreline and surficial erosional processes, with a high potential for delivery to Shasta Lake and subsequent delivery to the upper Sacramento River. Therefore, the water quality impact of CP1 related to metals in the upper Sacramento River would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Lower Sacramento River and Delta and CVP/SWP Service Areas**

*Impact WQ-13 (CP1): Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction is not anticipated to affect water quality conditions in the extended study area. This impact would be less than significant.

Construction would only temporarily influence water quality in the primary study area. Construction effects are anticipated to be localized and would be further minimized with appropriate BMPs. Therefore, construction is not anticipated to affect water quality conditions downstream in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-14 (CP1): Temporary Construction-Related Temperature Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* As described in Impact WQ-13 (CP1), construction is not anticipated to affect water temperature in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-15 (CP1): Temporary Construction-Related Metal Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* As described in Impact WQ-13 (CP1), construction is not anticipated to affect metals in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-16 (CP1): Long-Term Sediment Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* Water quality effects of CP1 could influence the extended study area, but effects would diminish with distance into the study area. Water quality effects are attenuated by multiple factors including flow from tributaries, stormwater runoff, and municipal and agricultural discharges, as described below.

Because the Sacramento River is the primary supplier of suspended sediment to the Delta, sediment loading and discharge rates from the upper Sacramento River could affect water quality and beneficial uses in the extended study area. However, changes in sediment loading in the upper Sacramento River would be less than significant and changes in the extended study area would be even smaller. Therefore, the impact on sediment would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-17 (CP1): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* Analysis of temperature modeling shows little to no change in temperature at RBDD caused by CP1. This suggests that there would be no changes in temperature beyond RBDD as a result of CP1. This conclusion is further supported by the operational experience of the CVP, which indicates that the 60-mile stretch of river between Keswick Dam and Red Bluff is the extent to which the Shasta-Trinity Division can control temperatures through normal operations of the CVP. Therefore, no temperature effects are anticipated in the extended study area. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-18 (CP1): Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended*

*Study Area* CP1 would alter the operations of Shasta Lake. Increases in metals concentrations can result from changes in flows that cause increases in concentrations of suspended sediments during high-flow periods. The reduction in frequency and magnitude of peak flow events resulting from CP1 would suggest a beneficial impact for metals; however, as described in Impact WQ-6 (CP1), two depositional features associated with historic copper mining and smelting operation within the Squaw Creek Arm of Shasta Lake could be subjected to shoreline and surficial erosional processes, with the potential for delivery to Shasta Lake and subsequent delivery to the Sacramento River. Therefore, the water quality impact of CP1 related to metals in the lower Sacramento River could be potentially significant, because operation of the project could add substantial additional amounts of metal to the river system. Mitigation for this impact is proposed in Section 7.3.5.

*Salinity* CP1 would differ from the No-Action Alternative primarily through a 256-TAF enlargement of Shasta Lake. Potential impacts, which are evaluated below, include the following:

- Delta salinity on the Sacramento River at Collinsville
- Delta salinity on the San Joaquin River at Jersey Point
- Delta salinity on the Sacramento River at Emmaton
- Delta salinity on the Old River at Rock Slough
- Delta water quality on the Delta-Mendota Canal at Jones Pumping Plant
- Delta water quality on the West Canal at the mouth of the Clifton Court Forebay
- Delta salinity on the San Joaquin River at Vernalis
- Delta salinity on the San Joaquin River at Brandt Bridge
- Delta salinity on the Old River near the Middle River
- Delta salinity on the Old River at Tracy Road Bridge
- X2 position

*Impact WQ-19a (CP1): Delta Salinity on the Sacramento River at Collinsville* Operations for CP1 would result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 10 percent; this would be within the range of natural variability. This impact would be less than significant.

The water quality requirement on the Sacramento River at Collinsville is specified in D-1641, and is defined for all year types, from October through April. The D-1641 objectives for the Sacramento River at Collinsville are defined in Table 7-7.

**Table 7-7. D-1641 Water Quality Objectives for the Sacramento River at Collinsville**

| Months | Year-Type | Value (mmhos/cm) |
|---|---|---|
| October | All | 19.0 |
| November–December | All | 15.5 |
| January | All | 12.5 |
| February–March | All | 8.0 |
| April–May | All | 11.0 |

*Source: SWRCB 2000*

Notes:
Year types defined by Sacramento Valley Index.
The requirement is the maximum monthly average of both daily high tide EC values or demonstration that equivalent or better protection will be provided at the location.

Key:
D-1641 = Revised Water Right Decision 1641
EC = electrical conductivity
mmhos/cm = millimhos per centimeter (unit of EC)

As shown in Table 7-8, operations for CP1 would result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 10 percent; this would be within the range of natural variability. Table 7-9 shows the number of months simulated EC values exceeded the standards for the Sacramento River at Collinsville in the period of simulation. The operation of CP1 would not result in any additional violations of the salinity standards for the Sacramento River at Collinsville under both Existing and Future conditions. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

**Table 7-8. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Collinsville**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 7.1 | 0.0 (0.1%) | 8.3 | 0.0 (0.2%) | 7.4 | 0.0 (-0.2%) | 8.4 | 0.0 (-0.2%) |
| Nov | 6.4 | 0.0 (0.2%) | 8.0 | 0.0 (-0.3%) | 6.6 | 0.0 (0.0%) | 8.1 | 0.0 (-0.4%) |
| Dec | 4.4 | 0.0 (-1.1%) | 6.5 | -0.1 (-1.5%) | 4.5 | 0.0 (-0.7%) | 6.6 | -0.1 (-1.4%) |
| Jan | 2.6 | 0.0 (-0.5%) | 4.8 | 0.0 (-0.4%) | 2.7 | 0.0 (-0.8%) | 4.9 | -0.1 (-1.4%) |
| Feb | 1.0 | 0.1 (6.3%) | 2.2 | 0.2 (8.3%) | 1.1 | 0.0 (-4.4%) | 2.3 | -0.1 (-5.6%) |
| Mar | 0.7 | 0.0 (2.7%) | 1.4 | 0.1 (3.9%) | 0.7 | 0.0 (-1.8%) | 1.4 | 0.0 (-2.3%) |
| Apr | 0.9 | 0.0 (0.9%) | 1.9 | 0.0 (1.1%) | 1.0 | 0.0 (-0.4%) | 1.9 | 0.0 (-0.6%) |
| May | 1.5 | 0.0 (-0.1%) | 3.0 | 0.0 (-0.1%) | 1.4 | 0.0 (-0.1%) | 2.9 | 0.0 (-0.5%) |
| Jun | 2.5 | 0.0 (0.0%) | 4.5 | 0.0 (-0.1%) | 2.4 | 0.0 (0.5%) | 4.4 | 0.0 (-0.7%) |
| Jul | 3.4 | 0.0 (-0.6%) | 5.5 | 0.0 (-0.6%) | 3.2 | 0.0 (-0.2%) | 5.4 | 0.0 (-0.4%) |
| Aug | 5.3 | -0.1 (-1.0%) | 6.7 | -0.1 (-1.6%) | 5.0 | 0.0 (0.0%) | 6.6 | 0.0 (0.1%) |
| Sep | 6.6 | 0.0 (-0.3%) | 8.4 | -0.1 (-0.9%) | 6.5 | 0.0 (-0.3%) | 8.1 | -0.1 (-0.6%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC081)*

Note:
Simulation period: 1922–1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-9. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Collinsville**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC081)*

Note:
Simulation period: 1922–1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19b (CP1): Delta Salinity on the San Joaquin River at Jersey Point*
On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in an average year. Moreover, CP1 would not increase the EC at Jersey Point. This impact would be less than significant.

The water quality requirement on the San Joaquin River at Jersey Point is specified in D-1641 as two components. The first component of the requirement begins on April 1, and extends through a year-type–dependent date. The second component of the Jersey Point requirement begins at the end of the first component, and ends on August 15. The numerical requirement of the second component is dependent on the year type. Objectives for the San Joaquin River at Jersey Point are defined in Table 7-10.

**Table 7-10. D-1641 Water Quality Objectives for the San Joaquin River at Jersey Point**

| Year Type | 0.45 EC April 1 to the Date Shown | EC from Date Shown to August 15 (mmhos/cm) |
|---|---|---|
| Wet | August 15 | 0.45 |
| Above Normal | August 15 | 0.45 |
| Below Normal | June 20 | 0.74 |
| Dry | June 15 | 1.35 |
| Critical | April 1 | 2.20 |

*Source: SWRCB 2000.*

Note:
Year types defined by Sacramento Valley Index. While requirement in D-1641 is the maximum 14-day running average of mean daily EC, modeling uses a monthly average.

Key:
D-1641 = Water Right Decision 1641
EC = electrical conductivity
mmhos/cm = millimhos per centimeter

While Table 7-11 shows EC for all months, the Jersey Point water quality requirement is only defined for April 1 through August 15. On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in an average year. Moreover, CP1 would not increase the EC at Jersey Point. Table 7-12 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Jersey Point in the period of simulation. CP1 would result in a slight increase in the frequency of violations (4 percent) during August under the Existing Conditions and up to 6 percent during June under the Future Conditions. Overall, the frequency of exceedence of salinity standards for the San Joaquin River at Jersey Point under CP1 would be similar to those under Existing and Future conditions.

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

*Impact WQ-19c (CP1): Delta Salinity on the Sacramento River at Emmaton*
On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis; moreover, CP1 would not increase the EC at Emmaton during this period by more than 0.2 percent. This impact would be less than significant.

Similar to the water quality requirement on the San Joaquin River at Jersey Point, the water quality requirement on the Sacramento River at Emmaton is specified in D-1641 as two components. The first component of the requirement begins on April 1, and extends through a year-type-dependent date. The second component of the Emmaton requirement begins at the end of the first component, and ends on August 15. The numerical requirement of the second component is dependent on the year type. Objectives for the Sacramento River at Emmaton are defined in Table 7-13.

**Table 7-11. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Jersey Point**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 2.1 | 0.0 (0.3%) | 2.3 | 0.0 (0.7%) | 2.1 | 0.0 (0.4%) | 2.3 | 0.0 (0.6%) |
| Nov | 1.9 | 0.0 (1.1%) | 2.3 | 0.0 (1.2%) | 2.0 | 0.0 (0.6%) | 2.3 | 0.0 (0.0%) |
| Dec | 1.5 | 0.0 (-0.5%) | 2.1 | 0.0 (-1.2%) | 1.6 | 0.0 (-0.4%) | 2.1 | 0.0 (-0.9%) |
| Jan | 1.0 | 0.0 (-0.2%) | 1.6 | 0.0 (-0.1%) | 1.1 | 0.0 (-1.0%) | 1.7 | 0.0 (-1.6%) |
| Feb | 0.5 | 0.0 (4.2%) | 0.9 | 0.1 (6.7%) | 0.5 | 0.0 (-0.8%) | 0.9 | 0.0 (-1.4%) |
| Mar | 0.3 | 0.0 (2.4%) | 0.4 | 0.0 (5.0%) | 0.3 | 0.0 (-1.9%) | 0.4 | 0.0 (-3.6%) |
| Apr | 0.3 | 0.0 (0.6%) | 0.3 | 0.0 (1.2%) | 0.3 | 0.0 (-0.4%) | 0.4 | 0.0 (-0.9%) |
| May | 0.3 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.3 | 0.0 (-0.5%) | 0.5 | 0.0 (-1.0%) |
| Jun | 0.5 | 0.0 (0.6%) | 0.9 | 0.0 (0.8%) | 0.5 | 0.0 (-0.8%) | 0.9 | 0.0 (-2.0%) |
| Jul | 0.7 | 0.0 (2.2%) | 1.3 | 0.0 (2.7%) | 0.7 | 0.0 (0.9%) | 1.3 | 0.0 (1.0%) |
| Aug | 1.2 | 0.0 (1.0%) | 1.6 | 0.0 (1.1%) | 1.2 | 0.0 (0.4%) | 1.7 | 0.0 (0.8%) |
| Sep | 1.9 | 0.0 (0.0%) | 2.3 | 0.0 (-0.6%) | 2.0 | 0.0 (0.2%) | 2.4 | 0.0 (0.5%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN018)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-12. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Jersey Point**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| Jun | 17 | 0.0 (0.0%) | 13 | 0.0 (0.0%) | 17 | 1.0 (5.9%) | 13 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 1.0 (0.0%) | 0 | 1.0 (0.0%) |
| Aug | 56 | 2.0 (3.6%) | 13 | 2.0 (15.4%) | 58 | 0.0 (0.0%) | 14 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN018)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

**Table 7-13. D-1641 Water Quality Objective for the Sacramento River at Emmaton**

| Year Type | 0.45 EC April 1 to the Date Shown | EC from Date Shown to August 15 (mmhos/cm) |
|---|---|---|
| Wet | August 15 | 0.45 |
| Above Normal | July 1 | 0.63 |
| Below Normal | June 20 | 1.14 |
| Dry | June 15 | 1.67 |
| Critical | April 1 | 2.78 |

*Source: SWRCB 2000*

Note:
Year types defined by Sacramento Valley Index. While requirement in D-1641 is the maximum 14-day running average of mean daily EC, modeling uses a monthly average.

Key:
D-1641 = Water Right Decision 1641
EC = electrical conductivity
mmhos/cm = millimhos per centimeter

While Table 7-14 shows the EC for all months, the Emmaton water quality requirement is only defined for April 1 through August 15. On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis; moreover, CP1 would not increase the EC at Emmaton during this period by more than 0.2 percent. Table 7-15 shows the number of months simulated EC values exceeded the standards for the Sacramento River at Emmaton in the period of simulation. Operations of CP1 would not result in any additional violation of salinity standards between October and March. Between April and September, CP1 would result in a decrease in the frequency of violations when compared to the baseline values under the Existing and Future conditions, except in June and August when there would be a slight increase under the Future Conditions. Overall, the compliance of standards for the Sacramento River at Emmaton would be similar to the baseline levels under both Existing and Future conditions. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

**Table 7-14. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Emmaton**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 2.2 | 0.0 (0.2%) | 2.7 | 0.0 (0.4%) | 2.4 | 0.0 (-0.4%) | 2.8 | 0.0 (-0.7%) |
| Nov | 1.9 | 0.0 (-0.3%) | 2.5 | 0.0 (-1.0%) | 1.9 | 0.0 (-0.4%) | 2.5 | 0.0 (-0.8%) |
| Dec | 1.2 | 0.0 (-1.8%) | 1.7 | 0.0 (-2.3%) | 1.2 | 0.0 (-1.4%) | 1.8 | 0.0 (-2.5%) |
| Jan | 0.7 | 0.0 (-1.0%) | 1.2 | 0.0 (-1.0%) | 0.7 | 0.0 (-0.9%) | 1.2 | 0.0 (-1.7%) |
| Feb | 0.3 | 0.0 (4.8%) | 0.5 | 0.0 (8.0%) | 0.3 | 0.0 (-5.2%) | 0.6 | 0.0 (-8.4%) |
| Mar | 0.2 | 0.0 (1.6%) | 0.3 | 0.0 (3.1%) | 0.3 | 0.0 (-1.5%) | 0.3 | 0.0 (-2.8%) |
| Apr | 0.3 | 0.0 (0.5%) | 0.4 | 0.0 (0.9%) | 0.3 | 0.0 (-0.5%) | 0.4 | 0.0 (-0.9%) |
| May | 0.4 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.1%) | 0.4 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.4%) |
| Jun | 0.6 | 0.0 (0.1%) | 1.2 | 0.0 (0.2%) | 0.6 | 0.0 (0.6%) | 1.1 | 0.0 (-0.3%) |
| Jul | 0.8 | 0.0 (-1.5%) | 1.5 | 0.0 (-1.5%) | 0.8 | 0.0 (-0.8%) | 1.4 | 0.0 (-1.1%) |
| Aug | 1.4 | 0.0 (-1.8%) | 2.0 | -0.1 (-2.7%) | 1.3 | 0.0 (-0.1%) | 1.9 | 0.0 (0.0%) |
| Sep | 2.0 | 0.0 (-0.5%) | 2.9 | 0.0 (-1.3%) | 2.0 | 0.0 (-0.9%) | 2.7 | 0.0 (-1.5%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC092)*

Note:
Simulation period: 1922–1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-15. Simulated Number of Months of Exceedence of the Salinity Standard for the San Sacramento River at Emmaton**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | **Existing Condition** (Number of Months) | **CP1 Change** (Number of Months (%)) | **Existing Condition** (Number of Months) | **CP1 Change** (Number of Months (%)) | **No-Action Alternative** (Number of Months) | **CP1 Change** (Number of Months (%)) | **No-Action Alternative** (Number of Months) | **CP1 Change** (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 2 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 3 | -1.0 (-33.3%) | 2 | 0.0 (0.0%) |
| Jun | 19 | 0.0 (0.0%) | 13 | 0.0 (0.0%) | 19 | 1.0 (5.3%) | 14 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 51 | -5.0 (-9.8%) | 9 | -3.0 (-33.3%) | 41 | 2.0 (4.9%) | 7 | 1.0 (14.3%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC092)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19d (CP1): Delta Salinity on the Old River at Rock Slough* On an average annual basis, all months except October through January under both the Existing Condition and Future Condition would be less than 150 mg/L. In dry and critical years, only October and November would exceed the standard under the Existing Condition, and October through February would exceed the standard in the Future Condition. In average annual years, CP1 would not increase chlorides by more than 1.2 percent, and even in that instance, the standard would be met. For dry and critical years, larger increases in chlorides would occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. This impact would be less than significant.

Rock Slough is the location of the CCWD diversion for the Contra Costa Canal. The actual requirement location is at Contra Costa Canal Pumping Plant No. 1, but in DSM2, the location is measured in the Old River at Rock Slough. The requirements, as defined in D-1641, specify a minimum number of days during the calendar year that the maximum mean daily chloride concentration of 150 mg/L must be maintained. Objectives for the Contra Costa Canal Pumping Plant No. 1 are defined in Table 7-16.

**Table 7-16. D-1641 Water Quality Objective for Contra Costa Canal Pumping Plant No. 1**

| Year Type | Number of Days Each Calendar Year Chlorides Less Than or Equal to 150 mg/L |
|---|---|
| Wet | 240 |
| Above Normal | 190 |
| Below Normal | 175 |
| Dry | 165 |
| Critical | 155 |

*Source: SWRCB 2000*

Note:
Year-types defined by Sacramento Valley Index. Maximum mean daily 150 mg/L Cl- for at least the number of days shown.

Key:
Cl- = chlorides
D-1641 = Water Right Decision 1641
mg/L = milligram per liter

The standard for chlorides at the Contra Costa Canal is defined by the number of days with less than 150 mg/L of chloride. The analysis of modeling output is limited to monthly average chlorides. However, on an average annual basis, all months except October through January under both the Existing Condition and Future Condition would be less than 150 mg/L. In dry and critical years, only October and November would exceed the standard under the Existing Condition, and October through February would exceed the standard in the Future Condition. As shown in Table 7-17, in average annual years, CP1 would not increase chlorides by more than 1.2 percent, and even in that instance (August under the Existing Condition), the standard would be met. For dry and critical years, larger increases in chlorides would occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. Table 7-18 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the Old River at Rock Slough in the period of simulation. CP1 would result in fewer violations compared to the basis of comparison under the Existing Conditions. Overall, CP1 would not alter the compliance level for Old River at Rock Slough observed under both Existing and Future conditions.

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

**Table 7-17. Simulated Monthly Average Chlorides and Percent Change for the Old River at Rock Slough**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP1 Change (mg/L (%)) | Existing Condition (mg/L) | CP1 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP1 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP1 Change (mg/L (%)) |
| Oct | 175.4 | 0.3 (0.2%) | 195.6 | 1.6 (0.8%) | 178.6 | 0.2 (0.1%) | 197.4 | 0.3 (0.1%) |
| Nov | 167.5 | 1.2 (0.7%) | 195.8 | 1.0 (0.5%) | 167.1 | 0.8 (0.5%) | 191.3 | 0.0 (0.0%) |
| Dec | 168.0 | 0.6 (0.4%) | 204.2 | 1.2 (0.6%) | 175.9 | 0.3 (0.2%) | 206.4 | -1.3 (-0.6%) |
| Jan | 156.2 | -1.1 (-0.7%) | 195.0 | -2.8 (-1.4%) | 170.2 | -1.1 (-0.6%) | 205.6 | -2.5 (-1.2%) |
| Feb | 124.9 | 1.1 (0.9%) | 157.9 | 3.4 (2.2%) | 140.9 | -0.6 (-0.4%) | 176.1 | -1.6 (-0.9%) |
| Mar | 80.4 | 0.5 (0.6%) | 85.8 | 1.7 (1.9%) | 83.1 | -1.3 (-1.6%) | 91.3 | -3.6 (-3.9%) |
| Apr | 76.9 | 0.2 (0.2%) | 78.0 | 0.5 (0.6%) | 73.5 | -0.5 (-0.7%) | 74.6 | -1.3 (-1.8%) |
| May | 68.8 | 0.0 (0.0%) | 73.9 | 0.1 (0.1%) | 62.9 | -0.1 (-0.2%) | 71.4 | -0.4 (-0.5%) |
| Jun | 61.0 | 0.1 (0.1%) | 82.3 | 0.1 (0.1%) | 60.7 | -0.3 (-0.4%) | 81.5 | -0.8 (-1.0%) |
| Jul | 70.1 | 0.6 (0.8%) | 102.0 | 1.7 (1.6%) | 68.7 | -0.1 (-0.1%) | 101.6 | -0.3 (-0.3%) |
| Aug | 88.5 | 1.0 (1.2%) | 133.6 | 2.1 (1.6%) | 90.7 | 0.3 (0.3%) | 133.2 | 1.2 (0.9%) |
| Sep | 134.6 | 0.3 (0.2%) | 172.7 | -0.7 (-0.4%) | 145.7 | 0.4 (0.2%) | 178.1 | 0.8 (0.5%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCCC006) converted to chlorides using the equation EC*0.268-24.*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

**Table 7-18. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Old River at Rock Slough**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Days) | CP1 Change (Number of Days (%)) | Existing Condition (Number of Days) | CP1 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP1 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP1 Change (Number of Days (%)) |
| Oct | 119 | -8.0 (-6.7%) | 57 | 9.0 (15.8%) | 149 | 10.0 (6.7%) | 61 | 5.0 (8.2%) |
| Nov | 176 | -7.0 (-4.0%) | 107 | -13.0 (-12.1%) | 152 | 14.0 (9.2%) | 84 | 3.0 (3.6%) |
| Dec | 332 | 15.0 (4.5%) | 173 | 15.0 (8.7%) | 309 | 4.0 (1.3%) | 151 | -5.0 (-3.3%) |
| Jan | 295 | -31.0 (-10.5%) | 185 | -29.0 (-15.7%) | 320 | -14.0 (-4.4%) | 204 | -2.0 (-1.0%) |
| Feb | 102 | 18.0 (17.6%) | 90 | 20.0 (22.2%) | 193 | 4.0 (2.1%) | 148 | 4.0 (2.7%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 12 | -6.0 (-50.0%) | 12 | -6.0 (-50.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RHCCC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19e (CP1): Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant* The water quality requirement on the Delta-Mendota Canal at Jones Pumping Plant has two components, a chloride requirement and an EC requirement. CP1 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

The Jones Pumping Plant is the primary point of export for the CVP water supply south of the Delta. The water quality requirement on the Delta-Mendota Canal at Jones Pumping Plant has two components, a chloride requirement and an EC requirement. Table 7-19 shows both the chloride and EC concentration requirements.

Table 7-20 shows the simulated chloride concentrations and Table 7-21 shows the EC for the Delta-Mendota Canal at Jones Pumping Plant.

**Table 7-19. D-1641 Water Quality Objective for the Delta-Mendota Canal at the Jones Pumping Plant**

| Year Type | Month | Chloride Concentration (mg/L) | Electrical conductivity (mmhos/cm) |
|---|---|---|---|
| All | October-September | 250 | 1.0 |

*Source: SWRCB 2000*

Note:
Year types defined by Sacramento Valley Index.

Key:
D-1641 = Water Right Decision 16-41
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter

**Table 7-20. Simulated Monthly Average Chlorides and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP1 Change (mg/L (%)) | Existing Condition (mg/L) | CP1 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP1 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP1 Change (mg/L (%)) |
| Oct | 113.2 | 0.2 (0.2%) | 124.3 | 1.0 (0.8%) | 112.6 | 0.1 (0.1%) | 123.4 | 0.2 (0.2%) |
| Nov | 111.5 | 0.7 (0.6%) | 128.1 | 0.8 (0.7%) | 109.8 | 0.4 (0.4%) | 124.8 | -0.1 (-0.1%) |
| Dec | 129.3 | 0.2 (0.1%) | 149.6 | 0.5 (0.3%) | 126.3 | 0.1 (0.1%) | 144.3 | -0.6 (-0.4%) |
| Jan | 128.2 | -0.6 (-0.5%) | 156.9 | -1.5 (-0.9%) | 125.9 | -0.1 (-0.1%) | 153.7 | -0.3 (-0.2%) |
| Feb | 120.1 | -0.6 (-0.5%) | 164.3 | -1.2 (-0.7%) | 117.2 | -0.6 (-0.5%) | 161.7 | -1.5 (-0.9%) |
| Mar | 105.3 | -0.2 (-0.1%) | 147.1 | 0.0 (0.0%) | 102.0 | -0.5 (-0.5%) | 141.9 | -0.7 (-0.5%) |
| Apr | 70.5 | -0.1 (-0.2%) | 97.1 | -0.3 (-0.3%) | 59.2 | -0.5 (-0.9%) | 82.1 | -1.3 (-1.5%) |
| May | 63.3 | 0.0 (0.0%) | 84.3 | 0.0 (0.0%) | 53.3 | -0.2 (-0.4%) | 75.0 | -0.4 (-0.6%) |
| Jun | 61.2 | 0.0 (0.0%) | 72.8 | -0.1 (-0.1%) | 60.9 | -0.1 (-0.1%) | 77.7 | -0.2 (-0.3%) |
| Jul | 61.9 | -0.4 (-0.7%) | 75.1 | 0.2 (0.2%) | 59.4 | -0.5 (-0.8%) | 76.4 | -1.1 (-1.4%) |
| Aug | 65.4 | 0.4 (0.7%) | 91.8 | 0.8 (0.9%) | 64.5 | 0.0 (0.1%) | 91.6 | 0.5 (0.5%) |
| Sep | 89.4 | 0.2 (0.2%) | 113.7 | -0.4 (-0.3%) | 90.9 | 0.2 (0.2%) | 111.4 | 0.4 (0.4%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006) converted to chlorides using the equation EC*0.273-43.9)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mg/L = milligrams per liter

**Table 7-21. Simulated Monthly Average Salinity and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.6%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.1%) |
| Nov | 0.6 | 0.0 (0.5%) | 0.6 | 0.0 (0.5%) | 0.6 | 0.0 (0.3%) | 0.6 | 0.0 (-0.1%) |
| Dec | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (0.2%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.3%) |
| Jan | 0.6 | 0.0 (-0.4%) | 0.7 | 0.0 (-0.7%) | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.2%) |
| Feb | 0.6 | 0.0 (-0.4%) | 0.8 | 0.0 (-0.6%) | 0.6 | 0.0 (-0.4%) | 0.8 | 0.0 (-0.7%) |
| Mar | 0.5 | 0.0 (-0.1%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (-0.3%) | 0.7 | 0.0 (-0.4%) |
| Apr | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.5%) | 0.5 | 0.0 (-1.0%) |
| May | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.4%) |
| Jun | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (-0.1%) | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) |
| Jul | 0.4 | 0.0 (-0.4%) | 0.4 | 0.0 (0.2%) | 0.4 | 0.0 (-0.5%) | 0.4 | 0.0 (-0.9%) |
| Aug | 0.4 | 0.0 (0.4%) | 0.5 | 0.0 (0.6%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.3%) |
| Sep | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (-0.2%) | 0.5 | 0.0 (0.1%) | 0.6 | 0.0 (0.3%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

Table 7-22 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the Delta-Mendota Canal at the Jones Pumping Plant in the period of simulation. As seen in Table 7-22, there would be no additional violations throughout the year except during February. Even in February, chloride values under CP1 would be similar to the baseline values under both Existing and Future conditions.

As evidenced by Table 7-22, the 250 mg/L chloride concentration would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP1 than under the basis of comparisons.

Similar to the chloride concentrations, the average annual and dry and critical year averages under the basis of comparison would be under the requirement in all months. CP1 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent.

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

**Table 7-22. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Days) | CP1 Change (Number of Days (%)) | Existing Condition (Number of Days) | CP1 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP1 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP1 Change (Number of Days (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 36 | 0.0 (0.0%) | 36 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922–1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

Table 7-23 shows the number of months simulated EC values exceeded the standards for the Delta-Mendota Canal at the Jones Pumping Plant in the period of simulation. CP1 would not result in any additional violations of the salinity standards except during February. Even in February, CP1 would not change the baseline compliance levels under both Existing and Future conditions.

*Impact WQ-19f (CP1): Delta Water Quality on the West Canal at the Mouth of the Clifton Court Forebay* The 250 mg/L chloride concentration at the West Canal would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP1 than under the basis of comparisons. CP1 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

Clifton Court Forebay is the source of water supply for the Banks Pumping Plant and SWP exports south of the Delta. Similar to the Delta-Mendota Canal at Jones Pumping Plant, the water quality requirement on the West Canal at the mouth of the Clifton Court Forebay has two components, a chloride requirement and an EC requirement. Table 7-24 shows both the chloride and EC concentration requirements.

**Table 7-23. Simulated Number of Months of Exceedence of the Salinity Standard for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

**Table 7-24. D-1641 Water Quality Objective for the West Canal at the Mouth of the Clifton Court Forebay**

| Year Type | Month | Chloride Concentration (mg/L) | Electrical conductivity (mmhos/cm) |
|---|---|---|---|
| All | October–September | 250 | 1.0 |

*Source: SWRCB 2000*

Note:
Year types defined by Sacramento Valley Index.

Key:
D-1641 = Water Right Decision 1641
mg/L = milligrams per liter
mmhos/cm = millimhos per centimeter

Table 7-25 shows the simulated chloride concentrations and Table 7-26 shows the EC for the West Canal at the mouth of the Clifton Court Forebay.

**Table 7-25. Simulated Monthly Average Chlorides and Percent Change for West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP1 Change (mg/L (%)) | Existing Condition (mg/L) | CP1 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP1 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP1 Change (mg/L (%)) |
| Oct | 111.2 | 0.2 (0.2%) | 123.4 | 1.1 (0.9%) | 113.5 | 0.1 (0.1%) | 125.3 | 0.2 (0.1%) |
| Nov | 108.3 | 0.9 (0.8%) | 126.8 | 1.0 (0.8%) | 109.7 | 0.4 (0.4%) | 125.7 | -0.2 (-0.1%) |
| Dec | 121.2 | 0.2 (0.2%) | 144.9 | 0.5 (0.3%) | 116.3 | 0.2 (0.1%) | 138.9 | -1.0 (-0.7%) |
| Jan | 116.4 | -0.8 (-0.7%) | 148.2 | -1.8 (-1.2%) | 111.8 | -0.3 (-0.3%) | 144.4 | -0.7 (-0.5%) |
| Feb | 107.2 | -0.6 (-0.6%) | 150.5 | -1.1 (-0.8%) | 99.7 | -0.9 (-0.9%) | 143.7 | -1.9 (-1.4%) |
| Mar | 92.2 | -0.6 (-0.7%) | 129.8 | -1.2 (-0.9%) | 80.5 | -0.6 (-0.8%) | 115.7 | -0.9 (-0.8%) |
| Apr | 63.0 | -0.1 (-0.2%) | 87.6 | -0.3 (-0.3%) | 55.0 | -0.5 (-1.0%) | 76.1 | -1.3 (-1.7%) |
| May | 57.5 | 0.0 (0.1%) | 78.2 | -0.1 (-0.1%) | 50.7 | -0.2 (-0.5%) | 72.3 | -0.4 (-0.6%) |
| Jun | 52.9 | 0.0 (0.1%) | 66.9 | -0.1 (-0.2%) | 53.7 | -0.1 (-0.3%) | 71.5 | -0.4 (-0.6%) |
| Jul | 53.3 | -0.4 (-0.8%) | 70.4 | 0.3 (0.5%) | 51.2 | -0.5 (-1.0%) | 69.8 | -1.1 (-1.5%) |
| Aug | 57.2 | 0.4 (0.7%) | 86.1 | 0.9 (1.0%) | 58.8 | 0.1 (0.1%) | 87.6 | 0.6 (0.7%) |
| Sep | 84.5 | 0.3 (0.3%) | 110.4 | -0.3 (-0.3%) | 89.6 | 0.2 (0.2%) | 111.5 | 0.5 (0.4%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003) converted to chlorides using the equation EC*0.273-43.9)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L= milligrams per liter

**Table 7-26. Simulated Monthly Average Salinity and Percent Change for West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.2%) | 0.6 | 0.0 (0.7%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) |
| Nov | 0.6 | 0.0 (0.6%) | 0.6 | 0.0 (0.6%) | 0.6 | 0.0 (0.3%) | 0.6 | 0.0 (-0.1%) |
| Dec | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (0.3%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.5%) |
| Jan | 0.6 | 0.0 (-0.5%) | 0.7 | 0.0 (-1.0%) | 0.6 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.4%) |
| Feb | 0.6 | 0.0 (-0.4%) | 0.7 | 0.0 (-0.6%) | 0.5 | 0.0 (-0.6%) | 0.7 | 0.0 (-1.0%) |
| Mar | 0.5 | 0.0 (-0.5%) | 0.6 | 0.0 (-0.7%) | 0.5 | 0.0 (-0.5%) | 0.6 | 0.0 (-0.6%) |
| Apr | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.5%) | 0.4 | 0.0 (-1.1%) |
| May | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.3 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.4%) |
| Jun | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (-0.1%) | 0.4 | 0.0 (-0.1%) | 0.4 | 0.0 (-0.4%) |
| Jul | 0.4 | 0.0 (-0.4%) | 0.4 | 0.0 (0.3%) | 0.3 | 0.0 (-0.6%) | 0.4 | 0.0 (-0.9%) |
| Aug | 0.4 | 0.0 (0.4%) | 0.5 | 0.0 (0.7%) | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.5%) |
| Sep | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (-0.2%) | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (0.3%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

Table 7-27 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the West Canal at the Clifton Court Forebay in the period of simulation. As seen in Table 7-27, there would be no additional violations throughout the year except during February. Even in February, CP1 would not change the baseline compliance levels under both Existing and Future conditions.

As shown in Table 7-27, the 250 mg/L chloride concentration would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP1 than under the basis of comparisons.

Similar to the chloride concentrations, the average annual and dry and critical year averages under the basis of comparison would be under the requirement in all months. CP1 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent.

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

**Table 7-27. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Days) | CP1 Change (Number of Days (%)) | Existing Condition (Number of Days) | CP1 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP1 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP1 Change (Number of Days (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 22 | 0.0 (0.0%) | 22 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

Tables 7-27 and 7-28 show average monthly simulated EC values and the number of months simulated EC values exceeded the standards for West Canal at the Clifton Court Forebay in the period of simulation. CP1 would not result in any additional violations of the salinity standards except during February. Even in February, CP1 would not change the baseline compliance levels under both Existing and Future conditions.

**Table 7-28. Simulated Number of Months of Exceedence of the Salinity Standard for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19g (CP1): Delta Salinity on the San Joaquin River at Vernalis* On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change the EC on the San Joaquin River at Vernalis. This impact would be less than significant.

To protect water quality in the south Delta, D-1641 includes a salinity objective at several locations on the San Joaquin River and on the Old River. The objective is the same for all four locations: the San Joaquin River at Airport Way Bridge in Vernalis, the San Joaquin River at Brandt Bridge, the Old River near the Middle River, and the Old River at Tracy Road Bridge. The water quality requirement is a maximum 30-day average of mean daily EC. Table 7-29 shows the south Delta water quality requirement.

**Table 7-29. D-1641 South Delta Water Quality Objective**

| Year Type | Months | EC Standard (mmhos/cm) |
|---|---|---|
| All | April–August | 0.7 |
| All | September–March | 1.0 |

*Source: SWRCB 2000*

Note:
Year types defined by Sacramento Valley Index. While requirement in D-1641 is the maximum 30-day running average of mean daily EC, modeling uses a monthly average. San Joaquin River at Vernalis measured at the Airport Way Bridge.

Key:
D-1641 = Water Right Decision 1641
EC = electrical conductivity
mmhos/cm = millimhos per centimeter

On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change the EC on the San Joaquin River at Vernalis, as shown in Table 7-30. Table 7-31 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Vernalis in the period of simulation. CP1 would not change the baseline compliance levels under both Existing and Future conditions.

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

*Impact WQ-19h (CP1): Delta Salinity on the San Joaquin River at Brandt Bridge* Impact WQ-19h (CP1) would be the same as Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the San Joaquin River at Brandt Bridge. This impact would be less than significant.

As previously mentioned, D-1641 contains a south Delta water quality requirement applicable at several locations, including on the San Joaquin River at Brandt Bridge. Table 7-29 contains the water quality requirement standards.

**Table 7-30. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Vernalis**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.1%) | 0.9 | 0.0 (0.2%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Apr | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) |
| Sep | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-31. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Vernalis**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| Mar | 10 | 0.0 (0.0%) | 10 | 0.0 (0.0%) | 8 | 0.0 (0.0%) | 8 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

Impact WQ-19h (CP1) would be the same as Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the San Joaquin River at Brandt Bridge, as shown in Table 7-32. Table 7-33 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Brandt Bridge in the period of simulation. CP1 would not change the existing compliance level except in June under the Future Conditions. Even in June, CP1 would result in 4 months of violation of salinity standards as compared to 3 months under the baseline conditions.

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

**Table 7-32. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Brandt Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.1%) | 0.9 | 0.0 (0.1%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-33. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Brandt Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| Mar | 21 | 0.0 (0.0%) | 19 | 0.0 (0.0%) | 14 | 0.0 (0.0%) | 13 | 0.0 (0.0%) |
| Apr | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 22 | 0.0 (0.0%) | 20 | 0.0 (0.0%) | 3 | 1.0 (33.3%) | 3 | 1.0 (33.3%) |
| Jul | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19i (CP1): Delta Salinity on the Old River near the Middle River*
Impact WQ-19i (CP1) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the Old River near the Middle River. This impact would be less than significant.

As previously mentioned, D-1641 contains a south Delta water quality requirement applicable at several locations, including on the Old River near the Middle River. Table 7-29 contains the water quality requirement standards.

Impact WQ-19i (CP1) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the Old River near the Middle River, as shown in Table 7-34. Table 7-35 shows the number of months simulated EC values exceeded the standards for the Old River near the Middle

River in the period of simulation. The compliance of salinity standards for the Old River near the Middle River would not change under CP1 except in July under Existing Conditions. In July, CP1 would result in 8 months of violation of salinity standards as compared to 7 months for the baseline under the Existing Conditions.

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

**Table 7-34. Simulated Monthly Average Salinity and Percent Change for the Old River near the Middle River**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.1%) | 0.5 | 0.0 (-0.1%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (-0.2%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.2%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.6 | 0.0 (-0.3%) | 0.7 | 0.0 (-0.7%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.5 | 0.0 (-0.4%) | 0.7 | 0.0 (-0.9%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.4%) | 0.5 | 0.0 (-0.8%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (-0.2%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.2%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.4%) | 0.4 | 0.0 (-1.2%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.1%) | 0.4 | 0.0 (0.0%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RMID041)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-35. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River near the Middle River**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 20 | 0.0 (0.0%) | 18 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 5 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| May | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 22 | 0.0 (0.0%) | 20 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 7 | 1.0 (14.3%) | 7 | 1.0 (14.3%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RMID041)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19j (CP1): Delta Salinity on the Old River at Tracy Road Bridge*
Impact WQ-19j (CP1) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the Old River at Tracy Road Bridge. This impact would be less than significant.

As previously mentioned, D-1641 contains a south Delta water quality requirement applicable at several locations, including on the Old River at Tracy Road Bridge. Table 7-29 contains the water quality requirement standards.

Impact WQ-19j (CP1) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the Old River at Tracy Road Bridge, as shown in Table 7-36. Table 7-37 shows the number of months simulated EC values exceeded the standards for the Old River near Tracy Road

Bridge in the period of simulation. On an annual average basis, the compliance of salinity standards under CP1 would not change from the Existing Conditions by more than 2 percent. Overall, CP1 would not alter the compliance level for the Old River near Tracy Road Bridge observed under both Existing and Future conditions.

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

**Table 7-36. Simulated Monthly Average Salinity and Percent Change for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP1 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.1%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.3%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.5%) |
| Jan | 0.8 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.6 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.4%) |
| Feb | 0.8 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.6 | 0.0 (-0.5%) | 0.7 | 0.0 (-1.1%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.5 | 0.0 (-0.1%) | 0.7 | 0.0 (0.0%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.3%) | 0.5 | 0.0 (-0.7%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) | 0.5 | 0.0 (-0.4%) |
| Jun | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.1%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (-0.1%) |
| Jul | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.4%) | 0.5 | 0.0 (-0.9%) |
| Aug | 0.6 | 0.0 (0.2%) | 0.6 | 0.0 (0.5%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.3%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.5 | 0.0 (0.1%) | 0.6 | 0.0 (0.2%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node ROLD059)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-37. Simulated Number of Days by Month of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP1 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 2 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 11 | 0.0 (0.0%) | 10 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 21 | 0.0 (0.0%) | 19 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| Apr | 23 | 0.0 (0.0%) | 21 | 0.0 (0.0%) | 2 | -1.0 (-50.0%) | 2 | -1.0 (-50.0%) |
| May | 0 | 1.0 (0.0%) | 0 | 1.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 16 | 0.0 (0.0%) | 14 | -1.0 (-7.1%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 10 | 1.0 (10.0%) | 8 | 1.0 (12.5%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node ROLD059)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-20 (CP1): X2 Position* CP1 would not change average monthly X2 in either average years or in dry and critical years by more than 0.1 kilometer (km) under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP1 would not increase the amount out of compliance. This impact would be less than significant.

Table 7-38 shows the simulated monthly average X2 position for CP1 compared to the Existing Condition and Future Condition baselines. CalSim-II calculates the X2 position on a 1-month delay; the values shown have been corrected to accurately reflect the X2 position for the specified month.

CP1 would not change average monthly X2 in either average years or in dry and critical years by more than 0.1 km under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP1 would not increase the amount out of compliance.

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

**Table 7-38. Simulated Monthly Average X2 Position**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (km) | CP1 Change (km (%)) | Existing Condition (km) | CP1 Change (km (%)) | No-Action Alternative (km) | CP1 Change (km (%)) | No-Action Alternative (km) | CP1 Change (km (%)) |
| Oct | 85.2 | 0.0 (0.0%) | 86.7 | 0.0 (0.0%) | 85.6 | 0.0 (0.0%) | 86.9 | 0.0 (0.0%) |
| Nov | 82.7 | 0.0 (0.0%) | 85.2 | 0.0 (0.0%) | 83.1 | 0.0 (0.0%) | 85.4 | 0.0 (-0.1%) |
| Dec | 77.3 | 0.0 (0.0%) | 83.0 | -0.1 (-0.2%) | 77.7 | 0.0 (0.0%) | 83.3 | -0.1 (-0.2%) |
| Jan | 71.6 | 0.1 (0.1%) | 80.4 | 0.1 (0.1%) | 72.0 | 0.0 (0.0%) | 80.7 | -0.1 (-0.1%) |
| Feb | 66.1 | 0.2 (0.3%) | 75.1 | 0.4 (0.5%) | 66.3 | 0.0 (0.0%) | 75.3 | -0.1 (-0.2%) |
| Mar | 65.7 | 0.1 (0.2%) | 74.0 | 0.2 (0.3%) | 65.8 | 0.0 (0.1%) | 74.1 | 0.1 (0.1%) |
| Apr | 68.1 | 0.0 (0.1%) | 75.5 | 0.1 (0.1%) | 68.1 | 0.0 (0.0%) | 75.6 | 0.0 (0.0%) |
| May | 71.3 | 0.0 (0.0%) | 78.9 | 0.0 (0.0%) | 71.3 | 0.0 (0.0%) | 78.8 | 0.0 (0.0%) |
| Jun | 75.2 | 0.0 (0.0%) | 81.3 | 0.0 (0.0%) | 75.2 | 0.0 (0.0%) | 81.2 | -0.1 (-0.2%) |
| Jul | 79.2 | 0.0 (0.0%) | 83.9 | 0.0 (0.0%) | 78.8 | 0.0 (0.0%) | 83.7 | 0.0 (0.0%) |
| Aug | 84.1 | -0.1 (-0.1%) | 85.7 | -0.2 (-0.2%) | 84.0 | 0.0 (0.0%) | 85.5 | 0.0 (0.0%) |
| Sep | 85.6 | 0.0 (0.0%) | 88.8 | -0.1 (-0.1%) | 85.8 | -0.1 (-0.1%) | 88.5 | -0.1 (-0.1%) |

*Source: Common Assumptions Common Modeling Package version 8D CalSim-II 2005 and 2030 simulations (Node X2_PRV)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
km = kilometer
X2 = geographic location of 2 parts per thousand near-bottom salinity isohaline in the Delta, measured in distance upstream from Golden Gate Bridge in Suisun Bay.

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

Like CP1, CP2 focuses on enlarging Shasta Dam and Shasta Lake consistent with the goals of the 2000 CALFED ROD, and was formulated for the primary purposes of increasing water supply reliability, increasing survival of anadromous fish, and improving water quality. In addition to the common features, CP2 consists of raising Shasta Dam 12.5 feet, an elevation change that would increase the full pool elevation by 14.5 feet and enlarge the total storage space in the reservoir by 443 TAF. This alternative would help reduce future shortages by increasing the reliability of the water supply in drought and average years. The increased CWP would also contribute to improved seasonal water temperatures for anadromous fish in the upper Sacramento River.

**Shasta Lake and Vicinity**

*Impact WQ-1 (CP2): Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-1 (CP1). However, the construction-related activities described in Chapter 2, "Alternatives," would result in about 500 more acres of exposed shoreline than CP1 and in about the same number of relocation acres (3,337) that would be subject to erosion. This alternative is similar to, but somewhat larger than CP1. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-2 (CP2): Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* Similar to CP1, construction activities associated with enlarging Shasta Dam as well as the relocation actions would result in sizeable areas that would be subject to surface disturbance, including jurisdictional waters within the influence zone of CP2. Efforts to document jurisdictional waters associated with relocation areas are ongoing. This information will be included, if available, in the Final EIS, as well as in the Section 404 permitting package, prior to issuance of a ROD.

Environmental commitments and BMPs for the various construction and relocation activities (e.g., bridge replacement, boat ramp construction, demolition of facilities) have been incorporated into CP2. These activities could include removal of riparian vegetation, thereby exposing water bodies to increased solar radiation for various time periods. A riparian revegetation program will be implemented at all construction and relocation sites as applicable to ensure that shade is quickly reestablished after construction is completed.

As described in Chapter 2, "Alternatives," although the TCD may not be operational for some period of time during construction, project sequencing will ensure that changes to water temperature and associated limnological conditions will be consistent with those that occur periodically under the No-Action Alternative associated with maintenance and outage periods.

Because of the large water surface area of Shasta Lake, coupled with the isolated and discrete nature of the relocation activities on the tributaries, temporary construction-related effects are not expected to modify water temperature in a manner that would have a negative effect on beneficial uses or result in a water quality violation. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-3 (CP2): Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-3 (CP1). There would be no construction activities that would disturb locations known to contain elevated metal concentrations in either sediments or the water column. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-4 (CP2): Long-Term Sediment Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* This impact is similar to WQ-4 (CP1), except that the exposure of an additional 1,735 acres of shoreline surrounding Shasta Lake would result in a potential for increased wave-related shoreline erosion (see Chapter 4, "Geology, Geomorphology, Minerals, and Soils"). This would be a potentially significant impact. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-5 (CP2): Long-Term Temperature Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Similar to CP1, this alternative would increase storage on a monthly basis although it would vary by water year. Table 7-39 shows the simulated monthly change in storage for CP2 as a percent increase above the No-Action Alternative. On average, CP2 would provide almost a 9 percent increase in the end-of-month storage on an annual basis.

**Table 7-39. Simulated Average Increased End-of-Month Shasta Lake Storage – CP2**

| Month | Existing Condition (TAF) | CP2 (TAF) | CP2 % Increase |
|---|---|---|---|
| Oct | 2,671 | 263 | 9.8% |
| Nov | 2,690 | 265 | 9.9% |
| Dec | 2,815 | 284 | 10.1% |
| Jan | 3,067 | 288 | 9.4% |
| Feb | 3,291 | 299 | 9.1% |
| Mar | 3,624 | 301 | 8.3% |
| Apr | 3,919 | 295 | 7.5% |
| May | 3,950 | 295 | 7.5% |
| Jun | 3,642 | 293 | 8.0% |
| Jul | 3,187 | 282 | 8.8% |
| Aug | 2,879 | 271 | 9.4% |
| Sep | 2,782 | 269 | 9.7% |

*Source: Common Assumptions Common Modeling Package Version 8D CalSim-II 2005 and 2030 simulations (Node S4+S44)*

Note:
Simulation period: 1922–2003

Key:
TAF = thousand acre-feet

Under CP2, existing water temperature requirements would typically be met in most years; therefore, the additional increase in water storage shown in Table 7-39 would primarily be released for water supply purposes. Accordingly, minimal increases in releases from Shasta Dam would be expected in months when Delta exports are constrained, or when flow is not usable for water supply purposes.

Similar to CP1, the increase in storage provided by CP2 fluctuates greatly throughout a year. A key indicator of water temperature benefits of CP2 to the upper Sacramento River between Keswick Dam and Red Bluff is the amount of cold water available in Shasta Lake prior to the water temperature operation season, about May through October. Similar to CP1, the CWP volume in the lake accumulates during the winter and early spring and is not likely to increase after April. Therefore, the expected increase in spring storage for CP2 should also result in an incremental increase in the CWP volume.

The simulated end-of-April volume of water with a temperature lower than 52˚F for the No-Action Alternative and the change in CWP volume for CP2 is shown, by SVI year type, in Table 7-40.

**Table 7-40. Simulated Average Volume of Water Less than 52˚F in Shasta Lake at the End of April – CP2**

| SVI Year Type | Existing Condition (TAF) | CP2 (TAF) | CP2 % Increase |
|---|---|---|---|
| Average of All Years | 1,577 | 152 | 9.6% |
| Wet | 1,807 | 237 | 13.1% |
| Above Normal | 1,721 | 182 | 10.6% |
| Below Normal | 1,743 | 130 | 7.5% |
| Dry | 1,451 | 111 | 7.6% |
| Critical | 928 | 22 | 2.4% |

*Source: Common Assumptions Common Modeling Package Version 8D SRWQM 2005 and 2030 simulations*

Note:
Simulation period: 1922-2003
Year types as defined by the Sacramento Valley Index

Key:
SVI = Sacramento Valley Index
TAF = thousand acre-feet

In addition to illustrating the average change in available CWP, Table 7-40 also shows the influence of climatic conditions on these values. The diversity between water year types, coupled with unique combinations of storage and rainfall would continue to influence the ability to manage storage in Shasta Lake to maximize carryover capacity. Although there would be a meaningful increase in active storage and carryover storage of the CWP, this increase is considered a less than significant impact. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-6 (CP2): Long-Term Metals Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Similar to CP1, the increase in storage associated with this alternative would not result in modifying the depth and thickness of the thermocline that persists in Shasta Lake.

Within the Squaw Creek Arm, two depositional features associated with historic copper mining and smelting operations are immediately adjacent to the shoreline of Shasta Lake in the general vicinity of the Bully Hill Mine. As mapped, these two sites appear to have about 7,300 cubic yards of material that could be subjected to shoreline and surficial erosional processes at slightly higher elevations on the features than CP1with a high potential for delivery to Shasta Lake. Under CP2, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Upper Sacramento River (Shasta Dam to Red Bluff)**

*Impact WQ-7 (CP2): Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction would include ground-disturbing activities that could result in soil erosion and sediment effects on the upper Sacramento River. This impact would be potentially significant.

This impact would be the same as Impact WQ-7 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-8 (CP2): Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in temperature effects on the upper Sacramento River because changes to water temperature in Shasta Lake and subsequent releases to the Sacramento River would be consistent with typical periodic fluctuations. This impact would be less than significant.

This impact would be identical to Impact WQ-8 (CP1). For the same reasons as described for Impact WQ-8 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-9 (CP2): Temporary Construction-Related Metal Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in water quality effects on the upper Sacramento River related to metals because construction would not disturb locations of known elevated metal concentrations. This impact would be less than significant.

This impact would be identical to Impact WQ-9 (CP1). For the same reasons described for Impact WQ-9 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-10 (CP2): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* No long-term water quality impacts are anticipated in the upper Sacramento River in regard to sediment, because modeling results have indicated that CP2 would cause little change in average mean monthly winter flows during some years, which could slightly reduce sediment transport. This impact would be less than significant.

This impact would be similar to Impact WQ-10 (CP1) because the extent of the effect of CP2 on sediment would be similar to but slightly greater than that for CP1 (i.e., CP2 would have greater potential to reduce erosional processes and sediment transport in the upper Sacramento River). For the same reasons as described for Impact WQ-10 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-11 (CP2): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Analysis of temperature modeling results indicates that CP2 would improve compliance with the temperature requirements on the Sacramento River because of the increased depth of the cold-water pool in Shasta Lake and the associated enhanced ability to regulate water temperature releases to the upper Sacramento River. Therefore, the impact of CP2 on water quality measured as temperature would be beneficial.

CP2 would increase the ability of Shasta Dam to release cold water and regulate water temperature in the upper Sacramento River, primarily in dry and critically dry years. Raising Shasta Dam 12.5 feet would increase the cold-water pool and benefit seasonal water temperatures along the upper Sacramento River. This section focuses on compliance with water quality standards for temperature. For an analysis of temperature effects on fisheries and aquatic habitat, see Chapter 11, “Fisheries and Aquatic Ecosystems.”

Analysis of temperature modeling results indicates that under both existing and future conditions, CP2 would have a beneficial effect on temperature within the upper Sacramento River, with a slight decrease in average monthly water temperature during summer. Decreased temperatures would improve compliance with the temperature objectives for the upper Sacramento River in the 2004 and 2009 BOs (NMFS 2004, 2009). CP2 would reduce temperature exceedences at Balls Ferry by 15 percent under existing conditions and 19 percent under future conditions. At the Bend Bridge compliance station, CP2 would reduce temperature exceedences by 6 percent under existing conditions and 8 percent under future conditions. Table 7-6 summarizes the temperature modeling results.

Based on this analysis, the impact of CP2 on water quality measured as temperature would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-12 (CP2): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Long-term operation of the project could result in water quality effects on the upper Sacramento River in regard to metals as a result of erosional processes to historic mining and smelting operation features. This impact would be potentially significant.

This impact would be similar to Impact WQ-12 (CP1) because the extent of the effect of CP2 on metals would be similar to but slightly greater than that for CP1. For the same reasons as described for CP1, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Lower Sacramento River and Delta and CVP/SWP Service Areas**
CP2 would differ from the No-Action Alternative primarily through a 443 TAF enlargement of Shasta Lake. The impacts described below are the same as described for CP1.

*Impact WQ-13 (CP2): Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards* Construction is not anticipated to affect water quality conditions in the extended study area. This impact would be less than significant.

This impact would be similar to Impact WQ-13 (CP1). For the same reasons as described for Impact WQ-13 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-14 (CP2): Temporary Construction-Related Temperature Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-14 (CP1). For the same reasons as described for Impact WQ-14 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-15 (CP2): Temporary Construction-Related Metal Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-15 (CP1). For the same reasons as described for Impact WQ-15 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-16 (CP2): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* Project implementation could affect water quality in the extended study area, but effects would diminish with distance. This impact would be less than significant.

This impact would be similar to Impact WQ-16 (CP1). For the same reasons as described for Impact WQ-16 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-17 (CP2): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact would be similar to Impact WQ-17 (CP1). For the same reasons as described for Impact WQ-17 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-18 (CP2): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact would be similar to Impact WQ-18 (CP1). For the same reasons as described for Impact WQ-18 (CP1), this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-19a (CP2): Delta Salinity on the Sacramento River at Collinsville* Impact WQ-19a (CP2) would be similar to Impact WQ-19a (CP1). As shown in Table 7-41, operations for CP2 result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 1 percent; this would be within the range of natural variability. Table 7-42 shows the number of months simulated EC values exceeded the standards for the Sacramento River at Collinsville in the period of simulation. The operation of CP2 would not result in any violation of the salinity standards under both Existing and Future conditions. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19b (CP2): Delta Salinity on the San Joaquin River at Jersey Point* On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in an average year. Moreover, CP2 would not increase the EC at Jersey Point. This impact would be less than significant.

Impact WQ-19b (CP2) would be similar to Impact WQ-19b (CP1). As shown in Table 7-43, the basis of comparison would meet the requirement on an average basis in both average years and in dry and critical years. Furthermore, all changes during April through August would be less than 1 percent. Table 7-44 shows the number of months simulated EC values exceeded the standards for San Joaquin River at Jersey Point in the period of simulation. CP2 would result in a slight increase in the frequency of violations (2 percent) during August under the Existing Conditions and up to 6 percent during June under the Future Conditions. Overall, frequency of violation of salinity standards for the San Joaquin River at Jersey Point under CP2 would be similar to those under Existing and Future conditions. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

**Table 7-41. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Collinsville**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 7.1 | 0.0 (0.2%) | 8.3 | 0.0 (0.5%) | 7.4 | 0.0 (-0.3%) | 8.4 | 0.0 (-0.4%) |
| Nov | 6.4 | 0.0 (0.0%) | 8.0 | 0.0 (-0.4%) | 6.6 | 0.0 (-0.2%) | 8.1 | -0.1 (-0.8%) |
| Dec | 4.4 | 0.0 (-1.1%) | 6.5 | -0.1 (-1.6%) | 4.5 | 0.0 (-0.8%) | 6.6 | -0.1 (-1.7%) |
| Jan | 2.6 | 0.0 (-0.4%) | 4.8 | 0.0 (-0.3%) | 2.7 | 0.0 (-0.9%) | 4.9 | -0.1 (-1.7%) |
| Feb | 1.0 | 0.1 (5.3%) | 2.2 | 0.1 (6.9%) | 1.1 | 0.0 (-2.4%) | 2.3 | -0.1 (-3.1%) |
| Mar | 0.7 | 0.0 (2.0%) | 1.4 | 0.0 (2.8%) | 0.7 | 0.0 (-0.5%) | 1.4 | 0.0 (-0.5%) |
| Apr | 0.9 | 0.0 (0.5%) | 1.9 | 0.0 (0.7%) | 1.0 | 0.0 (-0.3%) | 1.9 | 0.0 (-0.4%) |
| May | 1.5 | 0.0 (-0.4%) | 3.0 | 0.0 (-0.5%) | 1.4 | 0.0 (-0.4%) | 2.9 | 0.0 (-0.8%) |
| Jun | 2.5 | 0.0 (-0.1%) | 4.5 | 0.0 (-0.1%) | 2.4 | 0.0 (0.0%) | 4.4 | -0.1 (-1.4%) |
| Jul | 3.4 | 0.0 (-0.5%) | 5.5 | 0.0 (-0.4%) | 3.2 | 0.0 (-0.7%) | 5.4 | -0.1 (-1.2%) |
| Aug | 5.3 | -0.1 (-1.0%) | 6.7 | -0.1 (-1.6%) | 5.0 | 0.0 (-0.4%) | 6.6 | 0.0 (-0.7%) |
| Sep | 6.6 | 0.0 (-0.3%) | 8.4 | -0.1 (-1.0%) | 6.5 | 0.0 (-0.6%) | 8.1 | -0.1 (-1.2%) |

Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC081)

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-42. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Collinsville**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC081)*

**Table 7-43. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Jersey Point**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 2.1 | 0.0 (0.4%) | 2.3 | 0.0 (0.8%) | 2.1 | 0.0 (0.5%) | 2.3 | 0.0 (0.5%) |
| Nov | 1.9 | 0.0 (1.2%) | 2.3 | 0.0 (1.6%) | 2.0 | 0.0 (0.5%) | 2.3 | 0.0 (0.2%) |
| Dec | 1.5 | 0.0 (-0.4%) | 2.1 | 0.0 (-1.1%) | 1.6 | 0.0 (-0.2%) | 2.1 | 0.0 (-0.9%) |
| Jan | 1.0 | 0.0 (0.0%) | 1.6 | 0.0 (0.4%) | 1.1 | 0.0 (-1.0%) | 1.7 | 0.0 (-1.8%) |
| Feb | 0.5 | 0.0 (4.7%) | 0.9 | 0.1 (7.2%) | 0.5 | 0.0 (0.1%) | 0.9 | 0.0 (-0.1%) |
| Mar | 0.3 | 0.0 (2.6%) | 0.4 | 0.0 (4.9%) | 0.3 | 0.0 (-0.6%) | 0.4 | 0.0 (-1.3%) |
| Apr | 0.3 | 0.0 (0.5%) | 0.3 | 0.0 (1.1%) | 0.3 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) |
| May | 0.3 | 0.0 (-0.2%) | 0.5 | 0.0 (-0.2%) | 0.3 | 0.0 (-0.6%) | 0.5 | 0.0 (-1.4%) |
| Jun | 0.5 | 0.0 (0.9%) | 0.9 | 0.0 (1.3%) | 0.5 | 0.0 (-0.8%) | 0.9 | 0.0 (-2.2%) |
| Jul | 0.7 | 0.0 (2.8%) | 1.3 | 0.0 (3.5%) | 0.7 | 0.0 (0.9%) | 1.3 | 0.0 (1.0%) |
| Aug | 1.2 | 0.0 (1.4%) | 1.6 | 0.0 (1.4%) | 1.2 | 0.0 (0.1%) | 1.7 | 0.0 (0.3%) |
| Sep | 1.9 | 0.0 (0.3%) | 2.3 | 0.0 (-0.3%) | 2.0 | 0.0 (0.2%) | 2.4 | 0.0 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN018)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-44. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Jersey Point**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| Jun | 17 | 0.0 (0.0%) | 13 | 0.0 (0.0%) | 17 | 1.0 (5.9%) | 13 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 1.0 (0.0%) | 0 | 1.0 (0.0%) |
| Aug | 56 | 1.0 (1.8%) | 13 | 1.0 (7.7%) | 58 | 0.0 (0.0%) | 14 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN018)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19c (CP2): Delta Salinity on the Sacramento River at Emmaton*
On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis; moreover, CP2 would not increase the EC at Emmaton during this period by more than 0.2 percent. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact WQ-19c (CP2) would be similar to Impact WQ-19c (CP1). While Table 7-45 shows EC for all months, the Emmaton water quality requirement is only defined for April 1 through August 15. On an average monthly basis, for the basis of comparison, EC would meet requirements in all months on an average annual basis. Moreover, CP2 would not increase EC at Emmaton during this period by more than 0.2 percent. Table 7-46 shows the number of months simulated EC values exceeded the standards for the Sacramento River at Emmaton in the period of simulation. Operations of CP2 would not result in any violation of salinity standards between October and March. Between April and September, CP2 would result in a decrease in the frequency of violations when compared to the baseline values under the Existing and Future conditions, except in June and August when there would be a slight increase, under the Future Conditions. Overall, the compliance of salinity standards for the Sacramento River at Emmaton would be very similar to the baseline levels under both Existing and Future conditions.

**Table 7-45. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Emmaton**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 2.2 | 0.0 (0.4%) | 2.7 | 0.0 (0.7%) | 2.4 | 0.0 (-0.8%) | 2.8 | 0.0 (-1.1%) |
| Nov | 1.9 | 0.0 (-0.9%) | 2.5 | 0.0 (-1.5%) | 1.9 | 0.0 (-0.9%) | 2.5 | 0.0 (-1.7%) |
| Dec | 1.2 | 0.0 (-1.8%) | 1.7 | 0.0 (-2.5%) | 1.2 | 0.0 (-1.5%) | 1.8 | 0.0 (-2.8%) |
| Jan | 0.7 | 0.0 (-0.8%) | 1.2 | 0.0 (-0.8%) | 0.7 | 0.0 (-1.1%) | 1.2 | 0.0 (-2.0%) |
| Feb | 0.3 | 0.0 (4.1%) | 0.5 | 0.0 (6.7%) | 0.3 | 0.0 (-4.1%) | 0.6 | 0.0 (-6.8%) |
| Mar | 0.2 | 0.0 (1.3%) | 0.3 | 0.0 (2.5%) | 0.3 | 0.0 (-1.0%) | 0.3 | 0.0 (-1.8%) |
| Apr | 0.3 | 0.0 (0.2%) | 0.4 | 0.0 (0.4%) | 0.3 | 0.0 (-0.4%) | 0.4 | 0.0 (-0.8%) |
| May | 0.4 | 0.0 (-0.5%) | 0.7 | 0.0 (-0.6%) | 0.4 | 0.0 (-0.5%) | 0.7 | 0.0 (-0.8%) |
| Jun | 0.6 | 0.0 (-0.1%) | 1.2 | 0.0 (0.1%) | 0.6 | 0.0 (-0.5%) | 1.1 | 0.0 (-1.7%) |
| Jul | 0.8 | 0.0 (-1.3%) | 1.5 | 0.0 (-1.4%) | 0.8 | 0.0 (-1.5%) | 1.4 | 0.0 (-2.0%) |
| Aug | 1.4 | 0.0 (-2.1%) | 2.0 | -0.1 (-3.2%) | 1.3 | 0.0 (-0.4%) | 1.9 | 0.0 (-0.7%) |
| Sep | 2.0 | 0.0 (-0.5%) | 2.9 | 0.0 (-1.4%) | 2.0 | 0.0 (-1.4%) | 2.7 | -0.1 (-2.4%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC092)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-46. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Emmaton**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 2 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 3 | -1.0 (-33.3%) | 2 | 0.0 (0.0%) |
| Jun | 19 | 0.0 (0.0%) | 13 | 0.0 (0.0%) | 19 | 1.0 (5.3%) | 14 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 51 | -6.0 (-11.8%) | 9 | -4.0 (-44.4%) | 41 | 1.0 (2.4%) | 7 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC092)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19d (CP2): Delta Salinity on the Old River at Rock Slough* On an average annual basis, all months except October through January under both the Existing Condition and Future Condition would be less than 150 mg/L. In dry and critical years, only October and November would exceed the standard under the Existing Condition, and October through February would exceed the standard in the Future Condition. In average annual years, CP2 would not increase chlorides by more than 1.2 percent, and even in that instance, the standard would be met. For dry and critical years, larger increases in chlorides would occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. This impact would be less than significant.

Impact WQ-19d (CP2) would be similar to Impact WQ-19d (CP1). The standard for chlorides at the Contra Costa Canal is defined by the number of days with less than 150 mg/L chloride. The analysis of modeling output is limited to monthly average chlorides. However, on an average annual basis, all months except October through January under both the Existing Condition and

Future Condition would be less than 150 mg/L. As shown in Table 7-47, in dry and critical years, October through February exceed the standard in both the Existing Condition and Future Condition. In average annual years, CP2 would not increase chlorides by more than 1.2 percent, and even in the month of the largest increase (August under the Existing Condition), the standard would be met. For dry and critical years, larger increases in chlorides occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the requirement; it would already be exceeded under the basis of comparison. Table 7-48 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the Old River at Rock Slough in the period of simulation. On an annual average basis, CP2 would result in fewer violations compared to the Existing Conditions. Dry and Critical years would see a slight increase (2 percent) in violations of chloride standards for CP2 under the Existing Conditions. Overall, CP2 would not alter the compliance level observed under the Existing and Future conditions.

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

**Table 7-47. Simulated Monthly Average Chlorides and Percent Change for the Old River at Rock Slough**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP2 Change (mg/L (%)) | Existing Condition (mg/L) | CP2 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP2 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP2 Change (mg/L (%)) |
| Oct | 175.4 | 0.6 (0.3%) | 195.6 | 1.9 (1.0%) | 178.6 | 0.1 (0.1%) | 197.4 | 0.3 (0.2%) |
| Nov | 167.5 | 1.1 (0.7%) | 195.8 | 1.3 (0.7%) | 167.1 | 0.7 (0.4%) | 191.3 | -0.4 (-0.2%) |
| Dec | 168.0 | 0.9 (0.5%) | 204.2 | 2.0 (1.0%) | 175.9 | 0.4 (0.2%) | 206.4 | -0.7 (-0.3%) |
| Jan | 156.2 | -0.8 (-0.5%) | 195.0 | -2.1 (-1.1%) | 170.2 | -0.9 (-0.5%) | 205.6 | -2.6 (-1.3%) |
| Feb | 124.9 | 1.5 (1.2%) | 157.9 | 4.4 (2.8%) | 140.9 | -0.9 (-0.6%) | 176.1 | -2.5 (-1.4%) |
| Mar | 80.4 | 0.8 (0.9%) | 85.8 | 2.0 (2.3%) | 83.1 | -1.2 (-1.4%) | 91.3 | -3.7 (-4.1%) |
| Apr | 76.9 | 0.3 (0.4%) | 78.0 | 0.6 (0.8%) | 73.5 | -0.3 (-0.4%) | 74.6 | -1.1 (-1.4%) |
| May | 68.8 | -0.2 (-0.2%) | 73.9 | 0.0 (0.0%) | 62.9 | -0.1 (-0.1%) | 71.4 | -0.4 (-0.6%) |
| Jun | 61.0 | 0.0 (0.0%) | 82.3 | -0.1 (-0.1%) | 60.7 | -0.3 (-0.5%) | 81.5 | -1.1 (-1.3%) |
| Jul | 70.1 | 0.7 (1.0%) | 102.0 | 2.1 (2.1%) | 68.7 | -0.1 (-0.2%) | 101.6 | -0.3 (-0.3%) |
| Aug | 88.5 | 1.3 (1.5%) | 133.6 | 2.7 (2.1%) | 90.7 | 0.3 (0.4%) | 133.2 | 1.3 (1.0%) |
| Sep | 134.6 | 0.5 (0.4%) | 172.7 | -0.7 (-0.4%) | 145.7 | 0.3 (0.2%) | 178.1 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCCC006) converted to chlorides using the equation EC*0.268-24*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

**Table 7-48. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Old River at Rock Slough**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Days) | CP2 Change (Number of Days (%)) | Existing Condition (Number of Days) | CP2 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP2 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP2 Change (Number of Days (%)) |
| Oct | 119 | -9.0 (-7.6%) | 57 | 11.0 (19.3%) | 149 | 8.0 (5.4%) | 61 | 7.0 (11.5%) |
| Nov | 176 | -28.0 (-15.9%) | 107 | -17.0 (-15.9%) | 152 | 12.0 (7.9%) | 84 | 3.0 (3.6%) |
| Dec | 332 | 15.0 (4.5%) | 173 | 18.0 (10.4%) | 309 | 11.0 (3.6%) | 151 | 0.0 (0.0%) |
| Jan | 295 | -27.0 (-9.2%) | 185 | -26.0 (-14.1%) | 320 | -13.0 (-4.1%) | 204 | -3.0 (-1.5%) |
| Feb | 102 | 26.0 (25.5%) | 90 | 26.0 (28.9%) | 193 | 1.0 (0.5%) | 148 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 2.0 (0.0%) | 0 | 2.0 (0.0%) | 12 | -8.0 (-66.7%) | 12 | -8.0 (-66.7%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCCC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19e (CP2): Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant* The water quality requirement on the Delta-Mendota Canal at Jones Pumping Plant has two components, a chloride requirement and an EC requirement. CP2 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

Impact WQ-19e (CP2) would be similar to Impact WQ-19e (CP1). Table 7-49 shows simulated chloride concentrations and Table 7-50 shows EC for the Delta-Mendota Canal at Jones Pumping Plant.

The 250 mg/L chloride concentration would not be exceeded on an average annual or dry or critical year basis. Furthermore, chloride concentrations would typically be lower under CP2 than under the basis of comparisons.

**Table 7-49. Simulated Monthly Average Chlorides and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP2 Change (mg/L (%)) | Existing Condition (mg/L) | CP2 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP2 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP2 Change (mg/L (%)) |
| Oct | 113.2 | 0.3 (0.3%) | 124.3 | 1.3 (1.0%) | 112.6 | 0.1 (0.1%) | 123.4 | 0.3 (0.3%) |
| Nov | 111.5 | 0.7 (0.6%) | 128.1 | 1.0 (0.8%) | 109.8 | 0.3 (0.3%) | 124.8 | -0.3 (-0.2%) |
| Dec | 129.3 | 0.4 (0.3%) | 149.6 | 0.9 (0.6%) | 126.3 | 0.2 (0.1%) | 144.3 | -0.4 (-0.2%) |
| Jan | 128.2 | -0.6 (-0.4%) | 156.9 | -1.2 (-0.8%) | 125.9 | 0.0 (0.0%) | 153.7 | -0.3 (-0.2%) |
| Feb | 120.1 | -0.3 (-0.2%) | 164.3 | -0.3 (-0.2%) | 117.2 | -1.4 (-1.2%) | 161.7 | -3.5 (-2.1%) |
| Mar | 105.3 | 0.1 (0.1%) | 147.1 | 0.5 (0.3%) | 102.0 | -0.2 (-0.2%) | 141.9 | -0.7 (-0.5%) |
| Apr | 70.5 | -0.1 (-0.2%) | 97.1 | -0.3 (-0.3%) | 59.2 | -0.6 (-1.1%) | 82.1 | -1.6 (-2.0%) |
| May | 63.3 | 0.0 (0.0%) | 84.3 | -0.1 (-0.2%) | 53.3 | -0.2 (-0.4%) | 75.0 | -0.5 (-0.7%) |
| Jun | 61.2 | -0.3 (-0.4%) | 72.8 | -0.7 (-1.0%) | 60.9 | -0.2 (-0.4%) | 77.7 | -0.5 (-0.6%) |
| Jul | 61.9 | -0.5 (-0.7%) | 75.1 | 0.0 (0.0%) | 59.4 | -0.7 (-1.2%) | 76.4 | -1.2 (-1.5%) |
| Aug | 65.4 | 0.4 (0.7%) | 91.8 | 0.9 (0.9%) | 64.5 | 0.0 (0.0%) | 91.6 | 0.3 (0.4%) |
| Sep | 89.4 | 0.3 (0.4%) | 113.7 | -0.3 (-0.3%) | 90.9 | 0.2 (0.2%) | 111.4 | 0.1 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006) converted to chlorides using the equation EC*0.273-43.9)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

Similar to the chloride concentrations, the average annual and dry and critical year averages under the basis of comparison would be under the requirement in all months. CP2 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent.

Table 7-49 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the Delta-Mendota Canal at the Jones Pumping Plant in the period of simulation. As seen in Table 7-49, there would be no additional violations throughout the year except during February. Even in February, chloride values under CP2 would be similar to the baseline values under both Existing and Future conditions.

**Table 7-50. Simulated Monthly Average Salinity and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.2%) | 0.6 | 0.0 (0.7%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.2%) |
| Nov | 0.6 | 0.0 (0.5%) | 0.6 | 0.0 (0.6%) | 0.6 | 0.0 (0.2%) | 0.6 | 0.0 (-0.2%) |
| Dec | 0.6 | 0.0 (0.2%) | 0.7 | 0.0 (0.5%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.2%) |
| Jan | 0.6 | 0.0 (-0.3%) | 0.7 | 0.0 (-0.6%) | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (-0.2%) |
| Feb | 0.6 | 0.0 (-0.2%) | 0.8 | 0.0 (-0.1%) | 0.6 | 0.0 (-0.8%) | 0.8 | 0.0 (-1.7%) |
| Mar | 0.5 | 0.0 (0.1%) | 0.7 | 0.0 (0.3%) | 0.5 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.4%) |
| Apr | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.6%) | 0.5 | 0.0 (-1.3%) |
| May | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (-0.1%) | 0.4 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.4%) |
| Jun | 0.4 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.6%) | 0.4 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.4%) |
| Jul | 0.4 | 0.0 (-0.4%) | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (-0.7%) | 0.4 | 0.0 (-1.0%) |
| Aug | 0.4 | 0.0 (0.4%) | 0.5 | 0.0 (0.6%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.2%) |
| Sep | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (-0.2%) | 0.5 | 0.0 (0.1%) | 0.6 | 0.0 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

Table 7-51 shows the number of months simulated EC values exceeded the standards for the Delta-Mendota Canal at the Jones Pumping Plant in the period of simulation. CP2 would not result in any additional violations of the salinity standards except during February. Even in February, CP2 would not change the baseline compliance levels under both Existing and Future conditions. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

**Table 7-51. Simulated Number of Months of Exceedence of the Salinity Standard for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19f (CP2): Delta Water Quality in the West Canal at the Mouth of the Clifton Court Forebay* The 250-mg/L chloride concentration at the West Canal would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP2 than under the basis of comparisons. CP2 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

Impact WQ-19f (CP2) would be similar to Impact WQ-19f (CP1). Table 7-52 shows simulated chloride concentrations and Table 7-53 shows EC for the West Canal at the mouth of the Clifton Court Forebay.

The 250 mg/L chloride concentration would not be exceeded on an average annual or dry or critical year basis. Furthermore, chloride concentrations would typically be lower under CP2 than under the basis of comparisons.

Similar to the chloride concentrations, the average annual and dry and critical year averages under the basis of comparison would be under the requirement in all months. CP2 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent.

**Table 7-52. Simulated Monthly Average Chlorides and Percent Change for West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP2 Change (mg/L (%)) | Existing Condition (mg/L) | CP2 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP2 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP2 Change (mg/L (%)) |
| Oct | 111.2 | 0.4 (0.4%) | 123.4 | 1.4 (1.2%) | 113.5 | 0.0 (0.0%) | 125.3 | 0.2 (0.2%) |
| Nov | 108.3 | 0.9 (0.8%) | 126.8 | 1.2 (0.9%) | 109.7 | 0.3 (0.3%) | 125.7 | -0.4 (-0.3%) |
| Dec | 121.2 | 0.4 (0.3%) | 144.9 | 1.0 (0.7%) | 116.3 | 0.2 (0.2%) | 138.9 | -0.6 (-0.4%) |
| Jan | 116.4 | -0.7 (-0.6%) | 148.2 | -1.6 (-1.1%) | 111.8 | -0.1 (-0.1%) | 144.4 | -0.8 (-0.6%) |
| Feb | 107.2 | -0.4 (-0.4%) | 150.5 | -0.3 (-0.2%) | 99.7 | -1.8 (-1.8%) | 143.7 | -4.6 (-3.2%) |
| Mar | 92.2 | -0.4 (-0.4%) | 129.8 | -0.7 (-0.5%) | 80.5 | -0.1 (-0.1%) | 115.7 | -0.3 (-0.3%) |
| Apr | 63.0 | -0.1 (-0.2%) | 87.6 | -0.3 (-0.4%) | 55.0 | -0.6 (-1.1%) | 76.1 | -1.6 (-2.1%) |
| May | 57.5 | 0.0 (0.0%) | 78.2 | -0.2 (-0.2%) | 50.7 | -0.2 (-0.4%) | 72.3 | -0.5 (-0.7%) |
| Jun | 52.9 | -0.2 (-0.5%) | 66.9 | -0.8 (-1.2%) | 53.7 | -0.3 (-0.6%) | 71.5 | -0.7 (-1.0%) |
| Jul | 53.3 | -0.5 (-0.9%) | 70.4 | 0.3 (0.4%) | 51.2 | -0.7 (-1.5%) | 69.8 | -0.9 (-1.4%) |
| Aug | 57.2 | 0.4 (0.7%) | 86.1 | 0.9 (1.1%) | 58.8 | 0.1 (0.1%) | 87.6 | 0.6 (0.7%) |
| Sep | 84.5 | 0.4 (0.5%) | 110.4 | -0.3 (-0.3%) | 89.6 | 0.2 (0.3%) | 111.5 | 0.2 (0.2%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003) converted to chlorides using the equation EC*0.273-43.9)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

**Table 7-53. Simulated Monthly Average Salinity and Percent Change for West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.3%) | 0.6 | 0.0 (0.9%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) |
| Nov | 0.6 | 0.0 (0.6%) | 0.6 | 0.0 (0.7%) | 0.6 | 0.0 (0.2%) | 0.6 | 0.0 (-0.2%) |
| Dec | 0.6 | 0.0 (0.2%) | 0.7 | 0.0 (0.5%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.3%) |
| Jan | 0.6 | 0.0 (-0.4%) | 0.7 | 0.0 (-0.8%) | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.4%) |
| Feb | 0.6 | 0.0 (-0.3%) | 0.7 | 0.0 (-0.2%) | 0.5 | 0.0 (-1.3%) | 0.7 | 0.0 (-2.4%) |
| Mar | 0.5 | 0.0 (-0.3%) | 0.6 | 0.0 (-0.4%) | 0.5 | 0.0 (-0.1%) | 0.6 | 0.0 (-0.2%) |
| Apr | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.6%) | 0.4 | 0.0 (-1.4%) |
| May | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) | 0.3 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.4%) |
| Jun | 0.4 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.7%) | 0.4 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.6%) |
| Jul | 0.4 | 0.0 (-0.5%) | 0.4 | 0.0 (0.2%) | 0.3 | 0.0 (-0.8%) | 0.4 | 0.0 (-0.8%) |
| Aug | 0.4 | 0.0 (0.4%) | 0.5 | 0.0 (0.7%) | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.5%) |
| Sep | 0.5 | 0.0 (0.3%) | 0.6 | 0.0 (-0.2%) | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

Table 7-54 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the West Canal at the Clifton Court Forebay in the period of simulation. As seen in Table 7-54, there would be no additional violations throughout the year except during February. Even in February, CP2 would not change the baseline compliance levels under both Existing and Future conditions.

Table 7-55 shows the number of months simulated EC values exceeded the standards for West Canal at the Clifton Court Forebay in the period of simulation. CP2 would not result in any additional violations of the salinity standards except during February. Even in February, CP2 would not change the baseline compliance levels under both Existing and Future conditions.

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

**Table 7-54. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 22 | -5.0 (-22.7%) | 22 | -5.0 (-22.7%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

**Table 7-55. Simulated Number of Months of Exceedence of the Salinity Standard for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19g (CP2): Delta Salinity on the San Joaquin River at Vernalis* On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP2 would not measurably change the EC on the San Joaquin River at Vernalis. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact WQ-19g (CP2) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the San Joaquin River at Vernalis, as shown in Table 7-56. Table 7-57 shows the number of months simulated EC values exceeded the standards for San Joaquin River at Vernalis in the period of simulation. As seen in Table 7-57, CP2 would not change the baseline compliance levels under both Existing and Future conditions.

**Table 7-56. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Vernalis**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Apr | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Sep | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-57. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Vernalis**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| Mar | 10 | 1.0 (10.0%) | 10 | 1.0 (10.0%) | 8 | 0.0 (0.0%) | 8 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19h (CP2): Delta Salinity on the San Joaquin River at Brandt Bridge* Impact WQ-19h (CP2) would be the same as Impact WQ-19g (CP2). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the San Joaquin River at Brandt Bridge. This impact would be less than significant.

Impact WQ-19h (CP2) would be similar to Impact WQ-19h (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the San Joaquin River at Brandt Bridge, as shown in Table 7-58. Table 7-59 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Brandt Bridge in the period of simulation. CP2 would not change the existing compliance level for salinity standards for the San Joaquin River at Brandt Bridge.

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

**Table 7-58. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Brandt Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-59. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Brandt Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| Mar | 21 | 0.0 (0.0%) | 19 | 0.0 (0.0%) | 14 | 0.0 (0.0%) | 13 | 0.0 (0.0%) |
| Apr | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 22 | 0.0 (0.0%) | 20 | 0.0 (0.0%) | 3 | 0.0 (0.0%) | 3 | 0.0 (0.0%) |
| Jul | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19i (CP2): Delta Salinity on the Old River near the Middle River*
Impact WQ-19i (CP2) would be similar to Impact WQ-19i (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the Old River near the Middle River. This impact would be less than significant.

Impact WQ-19i (CP2) would be similar to Impact WQ-19i (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the Old River near the Middle River, as shown in Table 7-60. Table 7-61 shows the number of months simulated EC values exceeded the standards for the Old River near the Middle River in the period of simulation. As shown in Table 7-61, the compliance of salinity standards for the Old River near the Middle River would not change under CP2 when compared to the Existing Conditions.

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

**Table 7-60. Simulated Monthly Average Salinity and Percent Change for the Old River near Middle River**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.1%) | 0.5 | 0.0 (-0.2%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (-0.1%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.2%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.6 | 0.0 (-0.5%) | 0.7 | 0.0 (-1.1%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.5 | 0.0 (-0.5%) | 0.7 | 0.0 (-1.0%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.5%) | 0.5 | 0.0 (-1.1%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (-0.3%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.5%) | 0.4 | 0.0 (-1.1%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.4 | 0.0 (0.2%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.1%) | 0.4 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RMID041)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-61. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River near Middle River**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 20 | 0.0 (0.0%) | 18 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 5 | -1.0 (-20.0%) | 5 | -1.0 (-20.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| May | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 22 | 0.0 (0.0%) | 20 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RMID041)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19j (CP2): Delta Salinity on the Old River at Tracy Road Bridge*
Impact WQ-19j (CP2) would be similar to Impact WQ-19j (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the Old River at Tracy Road Bridge. This impact would be less than significant.

Impact WQ-19j (CP2) would be similar to Impact WQ-19j (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP2 would not measurably change EC on the Old River at Tracy Road Bridge, as shown in Table 7-62. Table 7-63 shows the number of months simulated EC values exceeded the standards for the Old River near Tracy Road Bridge in the period of simulation. On an annual average basis, the compliance of salinity standards under CP2 would not change from the Existing Conditions by more than 2 percent. Overall, CP2 would not change the baseline compliance levels under both Existing and Future conditions.

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

**Table 7-62. Simulated Monthly Average Salinity and Percent Change for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP2 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (-0.1%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.2%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.2%) | 0.6 | 0.0 (-0.2%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.2%) |
| Jan | 0.8 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.3%) |
| Feb | 0.8 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.6 | 0.0 (-1.1%) | 0.7 | 0.0 (-2.3%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.5 | 0.0 (0.3%) | 0.7 | 0.0 (0.6%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.3%) | 0.5 | 0.0 (-0.6%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) | 0.5 | 0.0 (-0.5%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) | 0.5 | 0.0 (-0.4%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.6%) | 0.5 | 0.0 (-0.9%) |
| Aug | 0.6 | 0.0 (0.3%) | 0.6 | 0.0 (0.8%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.4%) |
| Sep | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.2%) | 0.5 | 0.0 (0.1%) | 0.6 | 0.0 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node ROLD059)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-63. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP2 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 2 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 11 | 0.0 (0.0%) | 10 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 21 | 0.0 (0.0%) | 19 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| Apr | 23 | 0.0 (0.0%) | 21 | 0.0 (0.0%) | 2 | -2.0 (-100.0%) | 2 | -2.0 (-100.0%) |
| May | 0 | 1.0 (0.0%) | 0 | 1.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 16 | -1.0 (-6.3%) | 14 | -1.0 (-7.1%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 10 | 1.0 (10.0%) | 8 | 1.0 (12.5%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node ROLD059)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-20 (CP2): X2 Position* CP2 would not change average monthly X2 in either average years or in dry and critical years by more than 0.1 km under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from C2 would not increase the amount out of compliance. This impact would be less than significant.

Impact WQ-20 (CP2) would be similar to Impact WQ-20 (CP1). Table 7-64 shows the simulated monthly average X2 position for CP2 as compared to the Existing Condition and Future Condition baselines. CalSim-II calculates the X2 position on a 1-month delay; the values shown have been corrected to accurately reflect the X2 position for the specified month.

CP2 would not change average monthly X2 in either average years or in dry or critical years by more than 0.1 km under either the Existing Condition or the Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP2 would not increase the amount out of compliance.

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

**Table 7-64. Simulated Monthly Average X2 Position**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (km) | CP2 Change (km (%)) | Existing Condition (km) | CP2 Change (km (%)) | No-Action Alternative (km) | CP2 Change (km (%)) | No-Action Alternative (km) | CP2 Change (km (%)) |
| Oct | 85.2 | 0.0 (0.0%) | 86.7 | 0.0 (0.0%) | 85.6 | 0.0 (0.0%) | 86.9 | 0.0 (0.0%) |
| Nov | 82.7 | 0.0 (0.0%) | 85.2 | 0.0 (0.0%) | 83.1 | 0.0 (0.0%) | 85.4 | -0.1 (-0.1%) |
| Dec | 77.3 | 0.0 (0.0%) | 83.0 | -0.2 (-0.2%) | 77.7 | 0.0 (0.0%) | 83.3 | -0.2 (-0.2%) |
| Jan | 71.6 | 0.1 (0.1%) | 80.4 | 0.1 (0.1%) | 72.0 | 0.0 (0.0%) | 80.7 | -0.1 (-0.1%) |
| Feb | 66.1 | 0.2 (0.2%) | 75.1 | 0.3 (0.4%) | 66.3 | 0.0 (0.1%) | 75.3 | 0.0 (0.0%) |
| Mar | 65.7 | 0.1 (0.2%) | 74.0 | 0.2 (0.3%) | 65.8 | 0.1 (0.1%) | 74.1 | 0.1 (0.1%) |
| Apr | 68.1 | 0.0 (0.1%) | 75.5 | 0.1 (0.1%) | 68.1 | 0.0 (0.0%) | 75.6 | 0.0 (0.0%) |
| May | 71.3 | 0.0 (0.0%) | 78.9 | 0.0 (0.0%) | 71.3 | 0.0 (0.0%) | 78.8 | 0.0 (0.0%) |
| Jun | 75.2 | 0.0 (0.0%) | 81.3 | 0.0 (0.0%) | 75.2 | 0.0 (0.0%) | 81.2 | -0.2 (-0.2%) |
| Jul | 79.2 | 0.0 (0.0%) | 83.9 | 0.0 (0.0%) | 78.8 | 0.0 (0.0%) | 83.7 | -0.1 (-0.1%) |
| Aug | 84.1 | -0.1 (-0.1%) | 85.7 | -0.2 (-0.2%) | 84.0 | 0.0 (0.0%) | 85.5 | -0.1 (-0.1%) |
| Sep | 85.6 | 0.0 (0.0%) | 88.8 | 0.0 (0.0%) | 85.8 | -0.1 (-0.1%) | 88.5 | -0.1 (-0.1%) |

*Source: Common Assumptions Common Modeling Package version 8D CalSim-II 2005 and 2030 simulations (Node X2_PRV)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
km = kilometer
X2 = geographic location of 2 parts per thousand near-bottom salinity isohaline in the Delta, measured in distance upstream from Golden Gate Bridge in Suisun Bay.

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

CP3 is similar to CP1. CP3 would differ from the No-Action Alternative primarily through a 634 TAF enlargement of Shasta Lake. The impacts described below are the same as for CP1. CP3 focuses on the greatest practical enlargement of Shasta Dam and Reservoir consistent with the goals of the 2000 CALFED ROD, and was formulated for the primary purposes of increasing water supply reliability, increasing survival of anadromous fish, and improving water quality. In addition to the common features, CP3 consists of raising Shasta Dam 18.5 feet, an elevation change that would increase the full pool elevation by 20.5 feet and enlarge the total storage space in the reservoir by 634 TAF to 5.19 million acre-feet. This comprehensive plan would help reduce future shortages by increasing the reliability of the water supply in drought and average years. The increased pool depth and volume would also contribute to improving seasonal water temperatures for anadromous fish on the upper Sacramento River.

**Shasta Lake and Vicinity**

*Impact WQ-1 (CP3): Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-1 (CP1). However, the construction-related activities described in Chapter 2, "Alternatives," would result in about 1,270 more acres of exposed shoreline than CP1 and in about the same number of relocation acres (3,337) that would be subject to erosion. This alternative is similar to, but somewhat larger than, CP1. This impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-2 (CP3): Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* Similar to CP1, construction activities associated with enlarging Shasta Dam as well as the relocation actions would result in sizeable areas that would be subject to surface disturbance, including jurisdictional waters within the influence zone of CP3. Efforts to document jurisdictional waters associated with relocation areas are ongoing. This information will be included if available in the Final EIS, as well as in the Section 404 permitting package, prior to issuance of a ROD.

Environmental commitments and BMPs for the various construction and relocation activities (e.g., bridge replacement, boat ramp construction, demolition of facilities) have been incorporated into CP3. These activities could include removal of riparian vegetation, thereby exposing water bodies to increased solar radiation for various time periods. A riparian revegetation program will be implemented at all construction and relocation sites as applicable to ensure that shade is quickly reestablished after construction is completed.

As described in Chapter 2, "Alternatives," although the TCD may not be operational for some period of time during construction, project sequencing will ensure that changes to water temperature and associated limnological conditions will be consistent with those that occur periodically under the No-Action Alternative associated with maintenance and outage periods.

Because of the large water surface area of Shasta Lake, coupled with the isolated and discrete nature of the relocation activities on the tributaries, temporary construction-related effects are not expected to modify water temperature in a manner that would have a negative effect on beneficial uses or result in a water quality violation. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-3 (CP3): Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-3 (CP1). There would be no construction activities that would disturb locations known to contain elevated metal concentrations in either sediments or the water column. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-4 (CP3): Long-Term Sediment Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* This impact is similar to WQ4 (CP1), except that the exposure of about 2,498 acres of shoreline surrounding Shasta Lake would result in a potential for increased wave-related shoreline erosion compared to the No-Action Alternative (see Attachment 1 of the *Water Quality Technical Report*). Therefore, this impact is potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-5 (CP3): Long-Term Temperature Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Similar to CP1, this alternative would increase storage on a monthly basis, although it would vary by water year. Table 7-65 illustrates the monthly change in simulated storage for CP3 as a percent increase above the No-Action Alternative. On average, CP3 represents almost a 13-percent increase in the end-of-month storage on an annual basis.

**Table 7-65. Simulated Average Increased End-of-Month Shasta Lake Storage – CP3 and CP5**

| Month | Existing Condition (TAF) | CP3 & CP5 (TAF) | CP3 & CP5 % Increase |
|---|---|---|---|
| Oct | 2,671 | 377 | 14.1% |
| Nov | 2,690 | 374 | 13.9% |
| Dec | 2,815 | 399 | 14.2% |
| Jan | 3,067 | 407 | 13.3% |
| Feb | 3,291 | 430 | 13.1% |
| Mar | 3,624 | 434 | 12.0% |
| Apr | 3,919 | 426 | 10.9% |
| May | 3,950 | 424 | 10.7% |
| Jun | 3,642 | 418 | 11.5% |
| Jul | 3,187 | 407 | 12.8% |
| Aug | 2,879 | 390 | 13.5% |
| Sep | 2,782 | 386 | 13.9% |

*Source: Common Assumptions Common Modeling Package Version 8D CalSim-II 2005 and 2030 simulations (Node S4+S44)*

Note:
Simulation period: 1922-2003

Key:
TAF = thousand acre-feet

Under CP3 existing water temperature requirements would typically be met in most years; therefore, the additional increase in water storage shown in Table 7-65 would primarily be released for water supply purposes. Accordingly, minimal increases in releases from Shasta Dam would be expected in months when Delta exports are constrained, or when flow is not usable for water supply purposes.

Similar to CP1, the increase in storage provided by CP3 fluctuates greatly throughout a year. A key indicator of water temperature benefits of CP3 to the upper Sacramento River between Keswick Dam and Red Bluff is the amount of cold water available in Shasta Lake before the water temperature operation season, about May through October. Similar to CP1, the CWP volume in the lake accumulates during winter and early spring and is not likely to increase after April. Therefore, the expected increase in spring storage for CP3 should also result in an incremental increase in the CWP volume.

The simulated end-of-April volume of water with a temperature lower than 52˚F for the No-Action Alternative and the change in CWP volume for CP3 is shown, by SVI, in Table 7-66.

**Table 7-66. Simulated Average Volume of Water Less than 52°F in Shasta Lake at the End of April – CP3 and CP5**

| SVI Year Type | Existing Condition (TAF) | CP3 & CP5 (TAF) | CP3 & CP5 % Increase |
|---|---|---|---|
| Average of All Years | 1,577 | 220 | 14.0% |
| Wet | 1,807 | 349 | 19.3% |
| Above Normal | 1,721 | 284 | 16.5% |
| Below Normal | 1,743 | 214 | 12.3% |
| Dry | 1,451 | 130 | 9.0% |
| Critical | 928 | 17 | 1.8% |

*Source: Common Assumptions Common Modeling Package Version 8D SRWQM 2005 and 2030 simulations*

Note:
Simulation period: 1922-2003
Year types as defined by the Sacramento Valley Index

Key:
SVI = Sacramento Valley Index
TAF = thousand acre-feet

In addition to illustrating the average change in available CWP, Table 7-66 also shows the influence of climatic conditions on these values. The diversity between water year types, coupled with unique combinations of storage and rainfall, would continue to influence the ability to manage storage in Shasta Lake to maximize carryover capacity. Although there is a meaningful increase in active storage and carryover storage of the CWP, this increase is considered a less than-significant impact. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-6 (CP3): Long-Term Metals Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Similar to CP1, the increase in storage associated with this alternative would not result in modifying the depth and thickness of the thermocline that persists in Shasta Lake.

Within the Squaw Creek Arm, two depositional features associated with historic copper mining and smelting operations are immediately adjacent to the shoreline of Shasta Lake in the general vicinity of the Bully Hill Mine. As mapped, these two sites appear to have about 7,300 cubic yards of material that could be subjected to shoreline and surficial erosional processes with an increase in reservoir elevations resultant related to CP3.

Under CP3, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Upper Sacramento River (Shasta Dam to Red Bluff)**

*Impact WQ-7 (CP3): Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality*

*Standards or Adversely Affect Beneficial Uses* Construction would include ground-disturbing activities that could result in soil erosion and sediment effects on the upper Sacramento River. This impact would be potentially significant.

This impact would be the same as Impact WQ-7 (CP1) and would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-8 (CP3): Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in temperature effects on the upper Sacramento River because changes to water temperature in Shasta Lake and subsequent releases to the Sacramento River would be consistent with typical periodic fluctuations. This impact would be less than significant.

This impact would be identical to Impact WQ-8 (CP1). For the same reasons as described for Impact WQ-8 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-9 (CP3): Temporary Construction-Related Metal Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in water quality effects on the upper Sacramento River related to metals because construction would not disturb locations of known elevated metal concentrations. This impact would be less than significant.

This impact would be identical to Impact WQ-9 (CP1). For the same reasons as described for Impact WQ-9 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-10 (CP3): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* No long-term water quality impacts are anticipated in the upper Sacramento River in regard to sediment, because modeling results have indicated that CP3 would cause little change in average mean monthly flow, and could cause a decrease in peak flows that are associated with increased sediment transport. This impact would be less than significant.

This impact would be similar to Impact WQ-10 (CP1) because the extent of the effect of CP3 on sediment would be similar to that for CP1. For the same reasons as described for Impact WQ-10 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-11 (CP3): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Analysis of temperature modeling results indicates that CP3 would improve compliance with the temperature requirements on the Sacramento River because of the increased depth of the cold-water pool in

Shasta Lake and the associated enhanced ability to regulate water temperature releases to the upper Sacramento River. Therefore, the impact of CP3 on water quality measured as temperature would be beneficial.

CP3 would increase the ability of Shasta Dam to release cold water and regulate water temperature in the upper Sacramento River, primarily in dry and critically dry years. Raising Shasta Dam 18.5 feet would increase the cold-water pool and benefit seasonal water temperatures along the upper Sacramento River. This section focuses on compliance with water quality standards for temperature. For an analysis of temperature effects on fisheries and aquatic habitat, see Chapter 11, "Fisheries and Aquatic Resources."

Analysis of temperature modeling results indicates that CP3 would have a beneficial effect on temperature within the upper Sacramento River, with a slight decrease in average monthly water temperature during summer under both existing and future conditions. Decreased temperatures would improve compliance with the temperature objectives for the upper Sacramento River in the 2004 BO. CP3 would reduce temperature exceedences at Balls Ferry by 18 percent under existing conditions and 24 percent under future conditions. At the Bend Bridge compliance station, CP3 would reduce temperature exceedences by 8 percent under existing conditions and 11 percent under future conditions. Table 7-6 summarizes the temperature modeling results.

Based on this analysis, the impact of CP3 on water quality measured as temperature would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-12 (CP3): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Long-term operation of the project could result in water quality effects on the upper Sacramento River in regard to metals as a result of erosional processes to historic mining and smelting operation features. This impact would be potentially significant.

This impact would be similar to Impact WQ-12 (CP3) because the extent of the effect of CP3 on metals would be similar to that for CP1. For the same reasons as described for Impact WQ-12 (CP1), this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Lower Sacramento River and Delta and CVP/SWP Service Areas**

*Impact WQ-13 (CP3): Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction is not anticipated to affect water quality conditions in the extended study area. This impact would be less than significant.

This impact would be similar to Impact WQ-13 (CP1). For the same reasons described for Impact WQ-13 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-14 (CP3): Temporary Construction-Related Temperature Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-14 (CP1). For the same reasons described for Impact WQ-14 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-15 (CP3): Temporary Construction-Related Metal Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-15 (CP1). For the same reasons described for Impact WQ-15 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-16 (CP3): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* Project implementation could affect water quality in the extended study area, but effects would diminish with distance. This impact would be less than significant.

This impact would be similar to Impact WQ-16 (CP1). For the same reasons as described for Impact WQ-16 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-17 (CP3): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact would be similar to Impact WQ-17 (CP1). For the same reasons as described for Impact WQ-17 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-18 (CP3): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact would be similar to Impact WQ-18 (CP1). For the same reasons as described for Impact WQ-18 (CP1), this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-19a (CP3): Delta Salinity on the Sacramento River at Collinsville* Operations for CP3 would result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 10 percent; this would be within the range of natural variability. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact WQ-19a (CP3) would be similar to Impact WQ-19a (CP1). As shown in Table 7-67, operations for CP3 would result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 1 percent; this would be within the range of natural variability. Table 7-68 shows the number of months simulated EC values exceeded the standards for the Sacramento River at Collinsville in the period of simulation. The operation of CP3 would not result in any violation of the salinity standards under both Existing and Future conditions.

**Table 7-67. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Collinsville**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 7.1 | 0.0 (0.3%) | 8.3 | 0.1 (0.6%) | 7.4 | 0.0 (-0.5%) | 8.4 | 0.0 (-0.3%) |
| Nov | 6.4 | 0.0 (-0.1%) | 8.0 | 0.0 (-0.3%) | 6.6 | 0.0 (-0.3%) | 8.1 | -0.1 (-0.7%) |
| Dec | 4.4 | -0.1 (-1.5%) | 6.5 | -0.2 (-2.6%) | 4.5 | -0.1 (-1.3%) | 6.6 | -0.2 (-2.6%) |
| Jan | 2.6 | 0.0 (-0.8%) | 4.8 | 0.0 (-0.8%) | 2.7 | 0.0 (-1.5%) | 4.9 | -0.1 (-2.3%) |
| Feb | 1.0 | 0.1 (8.6%) | 2.2 | 0.2 (10.7%) | 1.1 | 0.0 (-2.7%) | 2.3 | -0.1 (-3.5%) |
| Mar | 0.7 | 0.0 (3.9%) | 1.4 | 0.1 (5.0%) | 0.7 | 0.0 (-0.7%) | 1.4 | 0.0 (-0.9%) |
| Apr | 0.9 | 0.0 (0.2%) | 1.9 | 0.0 (0.3%) | 1.0 | 0.0 (-0.3%) | 1.9 | 0.0 (-0.5%) |
| May | 1.5 | 0.0 (-0.6%) | 3.0 | 0.0 (-0.7%) | 1.4 | 0.0 (-0.5%) | 2.9 | 0.0 (-0.9%) |
| Jun | 2.5 | 0.0 (-0.7%) | 4.5 | 0.0 (-1.0%) | 2.4 | 0.0 (-0.3%) | 4.4 | -0.1 (-1.6%) |
| Jul | 3.4 | 0.0 (-1.0%) | 5.5 | -0.1 (-1.1%) | 3.2 | 0.0 (-1.0%) | 5.4 | -0.1 (-1.4%) |
| Aug | 5.3 | -0.1 (-1.2%) | 6.7 | -0.1 (-2.1%) | 5.0 | 0.0 (-0.5%) | 6.6 | -0.1 (-1.0%) |
| Sep | 6.6 | 0.0 (-0.3%) | 8.4 | -0.1 (-1.2%) | 6.5 | 0.0 (-0.7%) | 8.1 | -0.1 (-1.7%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC081)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-68. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC081)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19b (CP3): Delta Salinity on the San Joaquin River at Jersey Point*
On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in an average year. Moreover, CP3 would not increase the EC at Jersey Point. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

Impact WQ-19b (CP3) would be similar to Impact WQ-19b (CP1). As shown in Table 7-69, the basis of comparison would meet the requirement on an average basis in both average years and in dry and critical years. Furthermore, all changes during April through August would be less than 1 percent. Table 7-70 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Jersey Point in the period of simulation. CP3 would result in a slight increase in the frequency of violations (2 percent) during August under the Existing Conditions. Overall, frequency of violation of salinity standards for the San Joaquin River at Jersey Point under CP3 would be similar to those under Existing and Future conditions.

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

**Table 7-69. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Jersey Point**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 2.1 | 0.0 (0.6%) | 2.3 | 0.0 (1.1%) | 2.1 | 0.0 (0.4%) | 2.3 | 0.0 (0.8%) |
| Nov | 1.9 | 0.0 (1.1%) | 2.3 | 0.1 (2.3%) | 2.0 | 0.0 (0.6%) | 2.3 | 0.0 (0.8%) |
| Dec | 1.5 | 0.0 (-0.4%) | 2.1 | 0.0 (-1.2%) | 1.6 | 0.0 (-0.3%) | 2.1 | 0.0 (-0.7%) |
| Jan | 1.0 | 0.0 (-0.1%) | 1.6 | 0.0 (0.2%) | 1.1 | 0.0 (-1.6%) | 1.7 | 0.0 (-2.4%) |
| Feb | 0.5 | 0.0 (6.4%) | 0.9 | 0.1 (10.2%) | 0.5 | 0.0 (-0.1%) | 0.9 | 0.0 (-0.3%) |
| Mar | 0.3 | 0.0 (3.3%) | 0.4 | 0.0 (6.2%) | 0.3 | 0.0 (-0.5%) | 0.4 | 0.0 (-1.1%) |
| Apr | 0.3 | 0.0 (0.5%) | 0.3 | 0.0 (0.9%) | 0.3 | 0.0 (-0.1%) | 0.4 | 0.0 (-0.3%) |
| May | 0.3 | 0.0 (-0.4%) | 0.5 | 0.0 (-0.7%) | 0.3 | 0.0 (-0.6%) | 0.5 | 0.0 (-1.2%) |
| Jun | 0.5 | 0.0 (0.0%) | 0.9 | 0.0 (-0.1%) | 0.5 | 0.0 (-1.3%) | 0.9 | 0.0 (-2.7%) |
| Jul | 0.7 | 0.0 (1.8%) | 1.3 | 0.0 (2.1%) | 0.7 | 0.0 (1.1%) | 1.3 | 0.0 (1.2%) |
| Aug | 1.2 | 0.0 (1.2%) | 1.6 | 0.0 (0.9%) | 1.2 | 0.0 (0.0%) | 1.7 | 0.0 (0.3%) |
| Sep | 1.9 | 0.0 (0.3%) | 2.3 | 0.0 (-0.4%) | 2.0 | 0.0 (0.2%) | 2.4 | 0.0 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN018)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-70. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Jersey Point**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| Jun | 17 | 0.0 (0.0%) | 13 | 0.0 (0.0%) | 17 | 0.0 (0.0%) | 13 | 0.0 (0.0%) |
| Jul | 1 | 1.0 (100.0%) | 1 | 1.0 (100.0%) | 0 | 1.0 (0.0%) | 0 | 1.0 (0.0%) |
| Aug | 56 | 1.0 (1.8%) | 13 | 1.0 (7.7%) | 58 | 0.0 (0.0%) | 14 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN018)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19c (CP3): Delta Salinity on the Sacramento River at Emmaton*
On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis; moreover, CP3 would not increase the EC at Emmaton during this period by more than 0.2 percent. This impact would be less than significant.

Impact WQ-19c (CP3) would be similar to Impact WQ-19c (CP1). While Table 7-71 shows EC for all months, the Emmaton water quality requirement is only defined for April 1 through August 15. On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis. Moreover, CP3 would not increase EC at Emmaton during this period by more than 0.2 percent. Table 7-72 shows the number of months simulated EC values exceeded the standards for the Sacramento River at Emmaton in the period of simulation. Operations of CP3 would not result in any violation of salinity standards between October and March. Between April and September, CP3 would result in a decrease in the frequency of violations when compared to the baseline values under the Existing and Future conditions. Overall, the compliance of salinity standards for the Sacramento River at

Emmaton would be very similar to the baseline levels under both Existing and Future conditions.

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

**Table 7-71. Simulated Monthly Average Salinity and Percent Change for the Sacramento River at Emmaton**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 2.2 | 0.0 (0.2%) | 2.7 | 0.0 (0.8%) | 2.4 | 0.0 (-1.2%) | 2.8 | 0.0 (-1.0%) |
| Nov | 1.9 | 0.0 (-0.8%) | 2.5 | 0.0 (-1.6%) | 1.9 | 0.0 (-1.0%) | 2.5 | 0.0 (-1.6%) |
| Dec | 1.2 | 0.0 (-2.5%) | 1.7 | -0.1 (-4.3%) | 1.2 | 0.0 (-2.4%) | 1.8 | -0.1 (-4.4%) |
| Jan | 0.7 | 0.0 (-1.1%) | 1.2 | 0.0 (-1.3%) | 0.7 | 0.0 (-1.7%) | 1.2 | 0.0 (-2.7%) |
| Feb | 0.3 | 0.0 (6.6%) | 0.5 | 0.1 (10.6%) | 0.3 | 0.0 (-4.3%) | 0.6 | 0.0 (-7.1%) |
| Mar | 0.2 | 0.0 (2.3%) | 0.3 | 0.0 (4.3%) | 0.3 | 0.0 (-1.2%) | 0.3 | 0.0 (-2.3%) |
| Apr | 0.3 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.4%) | 0.3 | 0.0 (-0.5%) | 0.4 | 0.0 (-1.0%) |
| May | 0.4 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.7%) | 0.7 | 0.0 (-1.2%) |
| Jun | 0.6 | 0.0 (-1.6%) | 1.2 | 0.0 (-2.1%) | 0.6 | 0.0 (-0.9%) | 1.1 | 0.0 (-2.1%) |
| Jul | 0.8 | 0.0 (-1.9%) | 1.5 | 0.0 (-2.1%) | 0.8 | 0.0 (-1.9%) | 1.4 | 0.0 (-2.4%) |
| Aug | 1.4 | 0.0 (-2.3%) | 2.0 | -0.1 (-3.4%) | 1.3 | 0.0 (-0.5%) | 1.9 | 0.0 (-0.9%) |
| Sep | 2.0 | 0.0 (-0.5%) | 2.9 | 0.0 (-1.7%) | 2.0 | 0.0 (-1.7%) | 2.7 | -0.1 (-3.3%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC092)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-72. Simulated Number of Months of Exceedence of the Salinity Standard for the Sacramento River at Emmaton**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 2 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 3 | -1.0 (-33.3%) | 2 | -1.0 (-50.0%) |
| Jun | 19 | 0.0 (0.0%) | 13 | 0.0 (0.0%) | 19 | 1.0 (5.3%) | 14 | 0.0 (0.0%) |
| Jul | 1 | -1.0 (-100.0%) | 0 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 0 | 0.0 (0.0%) |
| Aug | 51 | -5.0 (-9.8%) | 9 | -3.0 (-33.3%) | 41 | 0.0 (0.0%) | 7 | -1.0 (-14.3%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAC092)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19d (CP3): Delta Salinity on the Old River at Rock Slough* On an average annual basis, all months except October through January under both the Existing Condition and Future Condition would be less than 150 mg/L. In dry and critical years, only October and November would exceed the standard under the Existing Condition, and October through February would exceed the standard in the Future Condition. In average annual years, CP3 would not increase chlorides by more than 1.2 percent, and even in that instance, the standard would be met. For dry and critical years, larger increases in chlorides would occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. This impact would be less than significant.

Impact WQ-19d (CP3) would be similar to Impact WQ-19d (CP1). The standard for chlorides at the Contra Costa Canal is defined by number of days with less than 150 mg/L chloride. The analysis of modeling output is limited to the monthly average chlorides. However, on an average annual basis, all months except October through January under both the Existing Condition and Future Condition, and September in dry and critical years, would be less than 150 mg/L. As shown in Table 7-73, in dry and critical years, October through February exceed the standard in both the Existing Condition and Future Condition. In average annual years, CP3 would not increase chlorides by more than 1.2 percent; however, in the month of the largest increase (September under the Existing Condition and Future Condition), the standard would be exceeded. For dry and critical years, larger increases in chlorides occur in November and December under Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. Table 7-74 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the Old River at Rock Slough in the period of simulation. Dry and critical years would see a slight increase (2 percent) in violations of chloride standards for CP3 under the Existing Conditions. Overall, CP3 would not alter the compliance level observed under both Existing and Future conditions.

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

**Table 7-73. Simulated Monthly Average Chlorides and Percent Change for the Old River at Rock Slough**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP3 Change (mg/L (%)) | Existing Condition (mg/L) | CP3 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP3 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP3 Change (mg/L (%)) |
| Oct | 175.4 | 0.8 (0.5%) | 195.6 | 2.2 (1.1%) | 178.6 | -0.2 (-0.1%) | 197.4 | 0.8 (0.4%) |
| Nov | 167.5 | 1.1 (0.7%) | 195.8 | 1.8 (0.9%) | 167.1 | 0.4 (0.2%) | 191.3 | 0.2 (0.1%) |
| Dec | 168.0 | 0.7 (0.4%) | 204.2 | 2.5 (1.2%) | 175.9 | 0.3 (0.2%) | 206.4 | 0.0 (0.0%) |
| Jan | 156.2 | -0.7 (-0.4%) | 195.0 | -2.4 (-1.2%) | 170.2 | -1.2 (-0.7%) | 205.6 | -2.8 (-1.4%) |
| Feb | 124.9 | 2.1 (1.7%) | 157.9 | 6.0 (3.8%) | 140.9 | -1.5 (-1.1%) | 176.1 | -3.2 (-1.8%) |
| Mar | 80.4 | 1.6 (2.1%) | 85.8 | 4.0 (4.7%) | 83.1 | -1.2 (-1.4%) | 91.3 | -3.6 (-4.0%) |
| Apr | 76.9 | 0.7 (1.0%) | 78.0 | 1.4 (1.8%) | 73.5 | -0.3 (-0.4%) | 74.6 | -1.0 (-1.4%) |
| May | 68.8 | 0.0 (-0.1%) | 73.9 | 0.1 (0.1%) | 62.9 | -0.2 (-0.4%) | 71.4 | -0.6 (-0.8%) |
| Jun | 61.0 | -0.2 (-0.3%) | 82.3 | -0.7 (-0.8%) | 60.7 | -0.4 (-0.6%) | 81.5 | -1.2 (-1.5%) |
| Jul | 70.1 | 0.2 (0.3%) | 102.0 | 0.9 (0.8%) | 68.7 | -0.2 (-0.3%) | 101.6 | -0.4 (-0.4%) |
| Aug | 88.5 | 1.0 (1.2%) | 133.6 | 2.0 (1.5%) | 90.7 | 0.6 (0.6%) | 133.2 | 2.1 (1.5%) |
| Sep | 134.6 | 0.6 (0.5%) | 172.7 | -0.7 (-0.4%) | 145.7 | 0.3 (0.2%) | 178.1 | 0.1 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCCC006) converted to chlorides using the equation EC*0.268-24*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

**Table 7-74. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Old River at Rock Slough**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | **Existing Condition** (Number of Days) | **CP3 Change** (Number of Days (%)) | **Existing Condition** (Number of Days) | **CP3 Change** (Number of Days (%)) | **No-Action Alternative** (Number of Days) | **CP3 Change** (Number of Days (%)) | **No-Action Alternative** (Number of Days) | **CP3 Change** (Number of Days (%)) |
| Oct | 119 | 2.0 (1.7%) | 57 | 5.0 (8.8%) | 149 | -14.0 (-9.4%) | 61 | 2.0 (3.3%) |
| Nov | 176 | -19.0 (-10.8%) | 107 | -16.0 (-15.0%) | 152 | 13.0 (8.6%) | 84 | 5.0 (6.0%) |
| Dec | 332 | 16.0 (4.8%) | 173 | 23.0 (13.3%) | 309 | 17.0 (5.5%) | 151 | 12.0 (7.9%) |
| Jan | 295 | -24.0 (-8.1%) | 185 | -27.0 (-14.6%) | 320 | -18.0 (-5.6%) | 204 | -7.0 (-3.4%) |
| Feb | 102 | 25.0 (24.5%) | 90 | 29.0 (32.2%) | 193 | -9.0 (-4.7%) | 148 | -9.0 (-6.1%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 2.0 (0.0%) | 0 | 2.0 (0.0%) | 12 | -6.0 (-50.0%) | 12 | -6.0 (-50.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCCC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19e (CP3): Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant* The water quality requirement on the Delta-Mendota Canal at Jones Pumping Plant has two components, a chloride requirement and an EC requirement. CP3 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

Impact WQ-19e (CP3) would be similar to Impact WQ-19e (CP1). Table 7-75 shows the simulated chloride concentrations and Table 7-76 shows EC for the Delta-Mendota Canal at Jones Pumping Plant.

The 250-mg/L chloride concentration would be not exceeded on an average annual or dry critical year basis. Furthermore, chloride concentrations would typically be lower under CP3 than under the basis of comparisons.

Table 7-77 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the Delta-Mendota Canal at the Jones Pumping Plant in the period of simulation. As seen in Table 7-77, there would be no additional violations throughout the year except during February. Even in February, chloride values under CP3 would be similar to the baseline values under both Existing and Future conditions.

**Table 7-75. Simulated Monthly Average Chlorides and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP3 Change (mg/L (%)) | Existing Condition (mg/L) | CP3 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP3 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP3 Change (mg/L (%)) |
| Oct | 113.2 | 0.5 (0.5%) | 124.3 | 1.4 (1.1%) | 112.6 | 0.0 (0.0%) | 123.4 | 0.6 (0.5%) |
| Nov | 111.5 | 0.7 (0.6%) | 128.1 | 1.2 (0.9%) | 109.8 | 0.2 (0.1%) | 124.8 | 0.1 (0.1%) |
| Dec | 129.3 | 0.3 (0.3%) | 149.6 | 1.3 (0.9%) | 126.3 | 0.1 (0.1%) | 144.3 | 0.0 (0.0%) |
| Jan | 128.2 | -0.5 (-0.4%) | 156.9 | -1.2 (-0.8%) | 125.9 | -0.1 (-0.1%) | 153.7 | -0.4 (-0.3%) |
| Feb | 120.1 | 0.2 (0.2%) | 164.3 | 0.9 (0.5%) | 117.2 | -1.6 (-1.3%) | 161.7 | -3.6 (-2.2%) |
| Mar | 105.3 | 0.6 (0.6%) | 147.1 | 1.2 (0.8%) | 102.0 | -0.5 (-0.5%) | 141.9 | -1.6 (-1.1%) |
| Apr | 70.5 | 0.0 (0.0%) | 97.1 | -0.2 (-0.2%) | 59.2 | -0.7 (-1.2%) | 82.1 | -1.7 (-2.1%) |
| May | 63.3 | 0.0 (0.0%) | 84.3 | -0.1 (-0.1%) | 53.3 | -0.3 (-0.6%) | 75.0 | -0.7 (-0.9%) |
| Jun | 61.2 | -0.4 (-0.6%) | 72.8 | -1.0 (-1.3%) | 60.9 | -0.3 (-0.6%) | 77.7 | -0.9 (-1.1%) |
| Jul | 61.9 | -0.8 (-1.2%) | 75.1 | -0.9 (-1.2%) | 59.4 | -1.0 (-1.6%) | 76.4 | -1.5 (-2.0%) |
| Aug | 65.4 | 0.1 (0.2%) | 91.8 | 0.3 (0.4%) | 64.5 | 0.0 (0.1%) | 91.6 | 0.6 (0.7%) |
| Sep | 89.4 | 0.4 (0.4%) | 113.7 | -0.4 (-0.3%) | 90.9 | 0.2 (0.3%) | 111.4 | 0.3 (0.3%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006) converted to chlorides using the equation EC*0.273-43.9)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

**Table 7-76. Simulated Monthly Average Salinity and Percent Change for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.3%) | 0.6 | 0.0 (0.8%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.3%) |
| Nov | 0.6 | 0.0 (0.4%) | 0.6 | 0.0 (0.7%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.6 | 0.0 (0.2%) | 0.7 | 0.0 (0.7%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (0.0%) |
| Jan | 0.6 | 0.0 (-0.3%) | 0.7 | 0.0 (-0.6%) | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (-0.2%) |
| Feb | 0.6 | 0.0 (0.1%) | 0.8 | 0.0 (0.4%) | 0.6 | 0.0 (-1.0%) | 0.8 | 0.0 (-1.8%) |
| Mar | 0.5 | 0.0 (0.4%) | 0.7 | 0.0 (0.6%) | 0.5 | 0.0 (-0.4%) | 0.7 | 0.0 (-0.8%) |
| Apr | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (-0.2%) | 0.4 | 0.0 (-0.7%) | 0.5 | 0.0 (-1.4%) |
| May | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.4 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.6%) |
| Jun | 0.4 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.8%) | 0.4 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.7%) |
| Jul | 0.4 | 0.0 (-0.7%) | 0.4 | 0.0 (-0.8%) | 0.4 | 0.0 (-0.9%) | 0.4 | 0.0 (-1.2%) |
| Aug | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.2%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.5%) |
| Sep | 0.5 | 0.0 (0.3%) | 0.6 | 0.0 (-0.2%) | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (0.2%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-77. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Days) | CP3 Change (Number of Days (%)) | Existing Condition (Number of Days) | CP3 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP3 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP3 Change (Number of Days (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 36 | 1.0 (2.8%) | 36 | 1.0 (2.8%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

Table 7-78 shows the number of months simulated EC values exceeded the standards for the Delta-Mendota Canal at the Jones Pumping Plant in the period of simulation. CP3 would not result in any additional violations of the salinity standards except during February. Even in February, CP3 would not change the baseline compliance levels under both Existing and Future conditions.

Similar to the chloride concentrations, the average annual and dry and critical year averages under the basis of comparison would be under the requirement in all months. CP3 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent.

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

**Table 7-78. Simulated Number of Months of Exceedence of the Salinity Standard for the Delta-Mendota Canal at the Jones Pumping Plant**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHCDMC006)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19f (CP3): Delta Water Quality in the West Canal at the Mouth of the Clifton Court Forebay* The 250 mg/L chloride concentration at the West Canal would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP3 than under the basis of comparisons. CP3 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

Impact WQ-19f (CP3) would be similar to Impact WQ-19f (CP1). Table 7-79 shows the simulated chloride concentrations and Table 7-80 shows EC for the West Canal at the mouth of the Clifton Court Forebay.

The 250 mg/L chloride concentration would be not exceeded on an average annual or dry or critical year basis. Furthermore, chloride concentrations would typically be lower under CP3 than under the basis of comparisons.

**Table 7-79. Simulated Monthly Average Chlorides and Percent Change for West Canal at Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mg/L) | CP3 Change (mg/L (%)) | Existing Condition (mg/L) | CP3 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP3 Change (mg/L (%)) | No-Action Alternative (mg/L) | CP3 Change (mg/L (%)) |
| Oct | 111.2 | 0.6 (0.5%) | 123.4 | 1.6 (1.3%) | 113.5 | -0.1 (-0.1%) | 125.3 | 0.4 (0.3%) |
| Nov | 108.3 | 0.8 (0.8%) | 126.8 | 1.5 (1.1%) | 109.7 | 0.2 (0.2%) | 125.7 | 0.1 (0.1%) |
| Dec | 121.2 | 0.3 (0.3%) | 144.9 | 1.2 (0.9%) | 116.3 | 0.1 (0.1%) | 138.9 | -0.1 (-0.1%) |
| Jan | 116.4 | -0.6 (-0.5%) | 148.2 | -1.7 (-1.2%) | 111.8 | -0.4 (-0.3%) | 144.4 | -1.0 (-0.7%) |
| Feb | 107.2 | -0.1 (-0.1%) | 150.5 | 0.2 (0.1%) | 99.7 | -2.0 (-2.0%) | 143.7 | -4.6 (-3.2%) |
| Mar | 92.2 | 0.2 (0.2%) | 129.8 | 0.4 (0.3%) | 80.5 | -0.6 (-0.7%) | 115.7 | -1.5 (-1.3%) |
| Apr | 63.0 | 0.1 (0.2%) | 87.6 | 0.1 (0.1%) | 55.0 | -0.7 (-1.2%) | 76.1 | -1.7 (-2.2%) |
| May | 57.5 | 0.1 (0.1%) | 78.2 | -0.1 (-0.1%) | 50.7 | -0.3 (-0.6%) | 72.3 | -0.7 (-1.0%) |
| Jun | 52.9 | -0.4 (-0.7%) | 66.9 | -1.1 (-1.7%) | 53.7 | -0.4 (-0.8%) | 71.5 | -1.1 (-1.5%) |
| Jul | 53.3 | -0.8 (-1.5%) | 70.4 | -0.6 (-0.9%) | 51.2 | -1.1 (-2.1%) | 69.8 | -1.2 (-1.7%) |
| Aug | 57.2 | 0.2 (0.3%) | 86.1 | 0.5 (0.6%) | 58.8 | 0.1 (0.3%) | 87.6 | 1.0 (1.1%) |
| Sep | 84.5 | 0.4 (0.5%) | 110.4 | -0.5 (-0.4%) | 89.6 | 0.3 (0.3%) | 111.5 | 0.3 (0.3%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003) converted to chlorides using the equation EC*0.273-43.9)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
EC = electrical conductivity
mg/L = milligrams per liter

**Table 7-80. Simulated Monthly Average Salinity and Percent Change for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.4%) | 0.6 | 0.0 (0.9%) | 0.6 | 0.0 (-0.1%) | 0.6 | 0.0 (0.2%) |
| Nov | 0.6 | 0.0 (0.5%) | 0.6 | 0.0 (0.9%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.1%) |
| Dec | 0.6 | 0.0 (0.2%) | 0.7 | 0.0 (0.7%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (-0.1%) |
| Jan | 0.6 | 0.0 (-0.4%) | 0.7 | 0.0 (-0.9%) | 0.6 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.5%) |
| Feb | 0.6 | 0.0 (-0.1%) | 0.7 | 0.0 (0.1%) | 0.5 | 0.0 (-1.4%) | 0.7 | 0.0 (-2.5%) |
| Mar | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (0.2%) | 0.5 | 0.0 (-0.5%) | 0.6 | 0.0 (-0.9%) |
| Apr | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.1%) | 0.4 | 0.0 (-0.7%) | 0.4 | 0.0 (-1.4%) |
| May | 0.4 | 0.0 (0.1%) | 0.4 | 0.0 (0.0%) | 0.3 | 0.0 (-0.3%) | 0.4 | 0.0 (-0.6%) |
| Jun | 0.4 | 0.0 (-0.4%) | 0.4 | 0.0 (-1.0%) | 0.4 | 0.0 (-0.4%) | 0.4 | 0.0 (-0.9%) |
| Jul | 0.4 | 0.0 (-0.8%) | 0.4 | 0.0 (-0.5%) | 0.3 | 0.0 (-1.1%) | 0.4 | 0.0 (-1.1%) |
| Aug | 0.4 | 0.0 (0.2%) | 0.5 | 0.0 (0.4%) | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.7%) |
| Sep | 0.5 | 0.0 (0.3%) | 0.6 | 0.0 (-0.3%) | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (0.2%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

Table 7-81 shows the number of days simulated chloride values exceeded the standards of 250 mg/L for the West Canal at the Clifton Court Forebay in the period of simulation. As seen in Table 7-81, there would be no additional violations throughout the year except during February. Even in February, CP3 would not change the baseline compliance levels under both Existing and Future conditions.

Table 7-82 shows the number of months simulated EC values exceeded the standards for the West Canal at the Clifton Court Forebay in the period of simulation. CP3 would not result in any additional violations of the salinity standards except during February. Even in February, CP3 would not change the baseline compliance levels under both Existing and Future conditions. Similar to the chloride concentrations, the average annual and dry and critical year averages under the basis of comparison would be under the requirement in all months. CP3 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent.

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

**Table 7-81. Simulated Number of Days by Month of Exceedence of the Chloride Standard for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Days) | CP3 Change (Number of Days (%)) | Existing Condition (Number of Days) | CP3 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP3 Change (Number of Days (%)) | No-Action Alternative (Number of Days) | CP3 Change (Number of Days (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 22 | -5.0 (-22.7%) | 22 | -5.0 (-22.7%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

**Table 7-82. Simulated Number of Months of Exceedence of the Salinity Standard for the West Canal at the Clifton Court Forebay**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node CHSWP003)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19g (CP3): Delta Salinity on the San Joaquin River at Vernalis* On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP3 would not measurably change the EC on the San Joaquin River at Vernalis. This impact would be less than significant.

Impact WQ-19g (CP3) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the San Joaquin River at Vernalis, as shown in Table 7-83. Table 7-84 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Vernalis in the period of simulation. As seen in Table 7-84, CP3 would not change the baseline compliance levels under both Existing and Future conditions.

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

### Table 7-83. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Vernalis

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Apr | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Sep | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-84. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Vernalis**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| Mar | 10 | 1.0 (10.0%) | 10 | 1.0 (10.0%) | 8 | 0.0 (0.0%) | 8 | 0.0 (0.0%) |
| Apr | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| May | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19h (CP3): Delta Salinity on the San Joaquin River at Brandt Bridge* Impact WQ-19h (CP3) would be the same as Impact WQ-19g (CP3). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the San Joaquin River at Brandt Bridge. This impact would be less than significant.

Impact WQ-19h (CP3) would be similar to Impact WQ-19h (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the San Joaquin River at Brandt Bridge, as shown in Table 7-85. Table 7-86 shows the number of months simulated EC values exceeded the standards for the San Joaquin River at Brandt Bridge in the period of simulation. CP3 would not change the Existing compliance level for salinity standards for the San Joaquin River at Brandt Bridge. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

**Table 7-85. Simulated Monthly Average Salinity and Percent Change for the San Joaquin River at Brandt Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (-0.1%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-86. Simulated Number of Months of Exceedence of the Salinity Standard for the San Joaquin River at Brandt Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| Mar | 21 | 0.0 (0.0%) | 19 | 0.0 (0.0%) | 14 | 0.0 (0.0%) | 13 | 0.0 (0.0%) |
| Apr | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) |
| May | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 22 | 0.0 (0.0%) | 20 | 0.0 (0.0%) | 3 | 0.0 (0.0%) | 3 | 0.0 (0.0%) |
| Jul | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RSAN112)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19i (CP3): Delta Salinity on the Old River near the Middle River*
Impact WQ-19i (CP3) would be similar to Impact WQ-19i (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the Old River near the Middle River. This impact would be less than significant.

Impact WQ-19i (CP3) would be similar to Impact WQ-19i (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the Old River near the Middle River, as shown in Table 7-87. Table 7-88 shows the number of months simulated EC values exceeded the standards for the Old River near the Middle River in the period of simulation. As shown in Table 7-88, the compliance of salinity standards for the Old River near the Middle River would not change under CP3 when compared to the Existing Conditions.

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

## Table 7-87. Simulated Monthly Average Salinity and Percent Change for the Old River near the Middle River

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.1%) | 0.5 | 0.0 (0.1%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.0%) | 0.5 | 0.0 (-0.2%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.1%) |
| Jan | 0.7 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.6 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.3%) |
| Feb | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.6 | 0.0 (-0.6%) | 0.7 | 0.0 (-1.3%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.5 | 0.0 (-0.4%) | 0.7 | 0.0 (-1.0%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.6%) | 0.5 | 0.0 (-1.2%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.2%) | 0.5 | 0.0 (-0.3%) |
| Jun | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (0.0%) | 0.5 | 0.0 (-0.1%) |
| Jul | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.7%) | 0.4 | 0.0 (-1.6%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (0.1%) | 0.4 | 0.0 (0.4%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (0.1%) | 0.4 | 0.0 (0.1%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RMID041)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-88. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River near the Middle River**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 1 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 6 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 20 | 0.0 (0.0%) | 18 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Apr | 5 | 0.0 (0.0%) | 5 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| May | 2 | 0.0 (0.0%) | 2 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 22 | 0.0 (0.0%) | 20 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 7 | 0.0 (0.0%) | 7 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 4 | 0.0 (0.0%) | 4 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node RMID041)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-19j (CP3): Delta Salinity on the Old River at Tracy Road Bridge*
Impact WQ-19j (CP3) would be similar to Impact WQ-19j (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the Old River at Tracy Road Bridge. This impact would be less than significant.

Impact WQ-19j (CP3) would be similar to Impact WQ-19j (CP1). On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in both average years and in dry and critical years. Moreover, CP3 would not measurably change EC on the Old River at Tracy Road Bridge, as shown in Table 7-89. Table 7-90 shows the number of months simulated EC values exceeded the standards for the Old River near Tracy Road Bridge in the period of simulation. On an annual average basis, the compliance of salinity standards under CP3 would not change from the Existing Conditions by more than 2 percent. Overall, CP3 would not change the baseline compliance levels under both Existing and Future conditions.

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

**Table 7-89. Simulated Monthly Average Salinity and Percent Change for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | Existing Condition (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) | No-Action Alternative (mmhos/cm) | CP3 Change (mmhos/cm (%)) |
| Oct | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.4%) |
| Nov | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.6 | 0.0 (0.0%) |
| Dec | 0.8 | 0.0 (0.0%) | 0.8 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (0.2%) |
| Jan | 0.8 | 0.0 (0.0%) | 0.9 | 0.0 (0.0%) | 0.6 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.4%) |
| Feb | 0.8 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.6 | 0.0 (-1.1%) | 0.7 | 0.0 (-2.3%) |
| Mar | 0.7 | 0.0 (0.0%) | 1.0 | 0.0 (0.0%) | 0.5 | 0.0 (0.2%) | 0.7 | 0.0 (0.1%) |
| Apr | 0.5 | 0.0 (0.0%) | 0.7 | 0.0 (0.0%) | 0.4 | 0.0 (-0.3%) | 0.5 | 0.0 (-0.7%) |
| May | 0.5 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.4 | 0.0 (-0.3%) | 0.5 | 0.0 (-0.6%) |
| Jun | 0.6 | 0.0 (0.1%) | 0.7 | 0.0 (0.3%) | 0.4 | 0.0 (-0.4%) | 0.5 | 0.0 (-0.7%) |
| Jul | 0.6 | 0.0 (-0.2%) | 0.7 | 0.0 (-0.4%) | 0.4 | 0.0 (-0.9%) | 0.5 | 0.0 (-1.2%) |
| Aug | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.1%) | 0.4 | 0.0 (0.1%) | 0.5 | 0.0 (0.7%) |
| Sep | 0.6 | 0.0 (0.0%) | 0.6 | 0.0 (0.0%) | 0.5 | 0.0 (0.2%) | 0.6 | 0.0 (0.3%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node ROLD059)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
mmhos/cm = millimhos per centimeter

**Table 7-90. Simulated Number of Months of Exceedence of the Salinity Standard for the Old River at Tracy Road Bridge**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Total All Years | | Dry and Critical Years | | Total All Years | | Dry and Critical Years | |
| | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | Existing Condition (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) | No-Action Alternative (Number of Months) | CP3 Change (Number of Months (%)) |
| Oct | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Nov | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Dec | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jan | 2 | 0.0 (0.0%) | 1 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Feb | 11 | 0.0 (0.0%) | 10 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Mar | 21 | 0.0 (0.0%) | 19 | 0.0 (0.0%) | 1 | -1.0 (-100.0%) | 1 | -1.0 (-100.0%) |
| Apr | 23 | 0.0 (0.0%) | 21 | 0.0 (0.0%) | 2 | -2.0 (-100.0%) | 2 | -2.0 (-100.0%) |
| May | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jun | 16 | 1.0 (6.3%) | 14 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Jul | 10 | 0.0 (0.0%) | 8 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Aug | 2 | 1.0 (50.0%) | 2 | 1.0 (50.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |
| Sep | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) | 0 | 0.0 (0.0%) |

*Source: Common Assumptions Common Modeling Package, version 8D, DSM2 Existing and Future simulations (Node ROLD059)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan

*Impact WQ-20 (CP3): X2 Position* CP3 would not change average monthly X2 in either average years or in dry and critical years by more than 0.1 km under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP3 would not increase the amount out of compliance. This impact would be less than significant.

Impact WQ-20 (CP3) would be similar to Impact WQ-20 (CP1). Table 7-91 shows the simulated monthly average X2 position for CP3 compared to the Existing Condition and Future Condition baselines. CalSim-II calculates the X2 position on a 1-month delay; the values shown have been corrected to accurately reflect the X2 position for the specified month.

CP3 would not change average monthly X2 in either average years or in dry or critical years by more than 0.1 km under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP3 would not increase the amount out of compliance.

**Table 7-91. Simulated Monthly Average X2 Position**

| Month | Existing Condition (2005) | | | | Future Condition (2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | Average All Years | | Dry and Critical Years | | Average All Years | | Dry and Critical Years | |
| | Existing Condition (km) | CP3 Change (km (%)) | Existing Condition (km) | CP3 Change (km (%)) | No-Action Alternative (km) | CP3 Change (km (%)) | No-Action Alternative (km) | CP3 Change (km (%)) |
| Oct | 85.2 | 0.0 (0.0%) | 86.7 | 0.0 (0.0%) | 85.6 | 0.0 (0.0%) | 86.9 | 0.0 (0.0%) |
| Nov | 82.7 | 0.0 (0.0%) | 85.2 | 0.0 (0.0%) | 83.1 | 0.0 (0.0%) | 85.4 | 0.0 (-0.1%) |
| Dec | 77.3 | 0.0 (0.0%) | 83.0 | -0.3 (-0.3%) | 77.7 | 0.0 (0.0%) | 83.3 | -0.2 (-0.3%) |
| Jan | 71.6 | 0.1 (0.1%) | 80.4 | 0.1 (0.2%) | 72.0 | 0.0 (0.0%) | 80.7 | -0.1 (-0.1%) |
| Feb | 66.1 | 0.2 (0.3%) | 75.1 | 0.4 (0.6%) | 66.3 | 0.1 (0.1%) | 75.3 | 0.0 (0.0%) |
| Mar | 65.7 | 0.1 (0.2%) | 74.0 | 0.2 (0.3%) | 65.8 | 0.1 (0.1%) | 74.1 | 0.1 (0.2%) |
| Apr | 68.1 | 0.0 (0.0%) | 75.5 | 0.0 (0.0%) | 68.1 | 0.0 (0.0%) | 75.6 | 0.0 (0.0%) |
| May | 71.3 | 0.0 (0.0%) | 78.9 | 0.0 (-0.1%) | 71.3 | 0.0 (0.0%) | 78.8 | 0.0 (0.0%) |
| Jun | 75.2 | 0.0 (0.0%) | 81.3 | -0.1 (-0.1%) | 75.2 | 0.0 (0.0%) | 81.2 | -0.2 (-0.3%) |
| Jul | 79.2 | 0.0 (0.0%) | 83.9 | -0.1 (-0.1%) | 78.8 | 0.0 (0.0%) | 83.7 | -0.1 (-0.1%) |
| Aug | 84.1 | -0.1 (-0.1%) | 85.7 | -0.2 (-0.3%) | 84.0 | 0.0 (-0.1%) | 85.5 | -0.1 (-0.2%) |
| Sep | 85.6 | 0.0 (0.0%) | 88.8 | -0.1 (-0.1%) | 85.8 | -0.1 (-0.1%) | 88.5 | -0.2 (-0.2%) |

*Source: Common Assumptions Common Modeling Package version 8D CalSim-II 2005 and 2030 simulations (Node X2_PRV)*

Note:
Simulation period: 1922-1994. Change as measured from either Existing Condition or No-Action Alternative. Dry and critical years as defined by the Sacramento Valley Index.

Key:
CP = Comprehensive Plan
km = kilometer
X2 = geographic location of 2 parts per thousand near-bottom salinity isohaline in the Delta, measured in distance upstream from Golden Gate Bridge in Suisun Bay.

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

#### *CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability*

The primary function of CP4 is to address survival of anadromous fish, while still improving water supply reliability. It focuses on increasing the volume of cold water available to the TCD through reservoir reoperations, and on raising Shasta Dam 18.5 feet. As with CP3 and the common features, this raise would increase the full pool elevation by 20.5 feet and enlarge total reservoir storage space by 634 TAF. This additional storage space would expand Shasta Lake's cold-water supply available to the TCD by 378 TAF, a feature that would help improve cooler water temperatures in the upper Sacramento River. CP4 would differ from the No-Action Alternative primarily through a 634 TAF enlargement of Shasta Lake, with 256 TAF operated for water supply reliability and 378 TAF of the storage dedicated to anadromous fish survivability, through an increase in available cold water for release to the Sacramento River. In addition, CP4 would include riparian, floodplain, and side channel habitat restoration activities at Reading Island.

**Shasta Lake and Vicinity**

*Impact WQ-1 (CP4): Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-1 (CP3). The nature of inundation and relocation impacts are consistent with those described for CP3 in Chapter 2, "Alternatives." This impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-2 (CP4): Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-2 (CP3). The nature of inundation and relocation impacts are consistent with those described for CP3 in Chapter 2, "Alternatives." This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-3 (CP4): Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-3 (CP1). There would be no construction activities that would disturb locations known to contain elevated metal concentrations in either sediments or the water column. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-4 (CP4): Long-Term Sediment Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* This impact would be similar to Impact WQ-4 (CP3). The nature of inundation and relocation impacts are consistent with those described for CP3. This would be a potentially significant impact. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-5 (CP4): Long-Term Temperature Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Similar to CP1, this alternative would increase storage on a monthly basis, although it would vary by water year. Table 7-92 illustrates the monthly change in simulated storage for CP4 as a percent increase above the No-Action Alternative. On average, CP4 represents about a 17-percent increase in the end-of-month storage on an annual basis.

Under CP4, existing water temperature requirements would typically be met in most years; therefore, the additional increase in water storage shown in Table 7-92 would primarily be released for water supply purposes. Accordingly, minimal increases in releases from Shasta Dam would be expected in months when Delta exports are constrained, or when flow is not usable for water supply purposes.

**Table 7-92. Simulated Average Increased End-of-Month Shasta Lake Storage – CP4**

| Month | Existing Condition (TAF) | CP4 (TAF) | CP4 % Increase |
|---|---|---|---|
| Oct | 2,671 | 522 | 19.5% |
| Nov | 2,690 | 526 | 19.6% |
| Dec | 2,815 | 538 | 19.1% |
| Jan | 3,067 | 543 | 17.7% |
| Feb | 3,291 | 553 | 16.8% |
| Mar | 3,624 | 553 | 15.3% |
| Apr | 3,919 | 548 | 14.0% |
| May | 3,950 | 549 | 13.9% |
| Jun | 3,642 | 547 | 15.0% |
| Jul | 3,187 | 540 | 16.9% |
| Aug | 2,879 | 528 | 18.3% |
| Sep | 2,782 | 523 | 18.8% |

*Source: Common Assumptions Common Modeling Package Version 8D CalSim-II 2005 and 2030 simulations (Node S4+S44)*

Note:
Simulation period: 1922-2003

Key:
TAF = thousand acre-feet

Similar to CP1, the increase in storage provided by CP4 fluctuates greatly throughout a year. A key indicator of water temperature benefits of CP3 to the upper Sacramento River between Keswick Dam and Red Bluff is the amount of cold water available in Shasta Lake prior to the water temperature operation season, about May through October. Similar to CP1, the CWP volume in the lake accumulates during the winter and early spring and is not likely to increase after April. Therefore, the expected increase in spring storage for CP4 should also result in an incremental increase in the CWP volume.

The simulated end-of-April volume of water with a temperature lower than 52˚F for the No-Action Alternative and the change in CWP volume for CP4 is shown, by SVI, in Table 7-93.

Under CP4, existing water temperature requirements would typically be met in most years; therefore, the additional increase in water storage shown in Table 7-92 would primarily be released for water supply purposes. Accordingly, minimal increases in releases from Shasta Dam would be expected in months when Delta exports are constrained, or when flow is not usable for water supply purposes.

**Table 7-93. Simulated Average Volume of Water Less than 52˚F in Shasta Lake at the End of April – CP4**

| SVI Year Type | Existing Condition (TAF) | CP4 (TAF) | CP4 % Increase |
|---|---|---|---|
| Average of All Years | 1,577 | 348 | 22.1% |
| Wet | 1,807 | 437 | 24.2% |
| Above Normal | 1,721 | 324 | 18.8% |
| Below Normal | 1,743 | 341 | 19.6% |
| Dry | 1,451 | 310 | 21.4% |
| Critical | 928 | 241 | 26.0% |

*Source: Common Assumptions Common Modeling Package Version 8D SRWQM 2005 and 2030 simulations*

Note:
Simulation period: 1922-2003
Year types as defined by the Sacramento Valley Index

Key:
SVI = Sacramento Valley Index
TAF = thousand acre-feet

In addition to illustrating the average change in available CWP, Table 7-93 also shows the influence of climatic conditions on these values. The diversity between water year types, coupled with unique combinations of storage and rainfall would continue to influence the ability to manage storage in Shasta Lake to maximize carryover capacity. Although there is a meaningful increase in active storage and carryover storage of the CWP, this increase is considered to be a less than significant impact. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-6 (CP4): Long-Term Metals Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* This impact is similar to CP1. The nature of inundation and relocation impacts are consistent with those described for CP3. It would be a potentially significant impact. Mitigation for this impact is proposed in Section 7.3.5.

**Upper Sacramento River (Shasta Dam to Red Bluff)**

*Impact WQ-7 (CP4): Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction would include ground-disturbing activities that could result in soil erosion and sediment effects on the upper Sacramento River. This impact would be potentially significant.

Ground-disturbing activities associated with construction could cause soil erosion and sedimentation of local drainages and eventually the Sacramento River. Construction activities could also discharge waste petroleum products or other construction-related substances that could enter these waterways/facilities in runoff. In addition, transportation, handling, and placement of materials used for gravel augmentation as well as clearing, grubbing, and grading during construction could also adversely affect water quality and temporarily increase turbidity and sedimentation downstream from the gravel augmentation sites. In-water construction work at some gravel augmentation sites could also result in temporary increase in turbidity, downstream sedimentation, and accidental discharge of construction-related substances into the river channel.

In addition, riparian, floodplain, and side channel habitat restoration activities at Reading Island as part of CP4 would involve breaching the levee using an excavator, loader, and compaction equipment and excavation of approximately 15,650 cubic yards of earthen material for off-site disposal, and potential vegetation clearing along 0.8 mile of channel. Invasive aquatic vegetation would be removed as well. Although in-water construction is expected to take place during periods of low flow in the Sacramento River (October to November) to minimize effects on water quality, construction activities related to habitat restoration and vegetation clearing could adversely affect water quality and temporarily increase turbidity and sedimentation downstream, or result in the accidental discharge of construction-related substances into the river channel. In addition, excavated sediments could be contaminated with pesticides and metals. Development and implementation of a SWPPP as part of the environmental commitments described in Chapter 2, “Alternatives,” would reduce potential impacts related to pesticides and metals. However, this impact would remain potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-8 (CP4): Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in temperature effects on the upper Sacramento River because changes to water temperature in Shasta Lake and subsequent releases to the Sacramento River would be consistent with typical periodic fluctuations. This impact would be less than significant.

This impact would be similar to Impact WQ-8 (CP1). For the same reasons as described for Impact WQ-8 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-9 (CP4): Temporary Construction-Related Metal Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in water quality effects on the upper Sacramento River related to metals because construction would not disturb locations of known elevated metal concentrations. This impact would be less than significant.

This impact would be similar to Impact WQ-9 (CP1). For the same reasons as described for Impact WQ-9 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-10 (CP4): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* No long-term water quality impacts are anticipated in the upper Sacramento River in regard to sediment, because modeling results have indicated that CP4 would cause little change in average mean monthly flow, and could cause a decrease in peak flows that are associated with increased sediment transport. This impact would be less than significant.

This impact would be similar to Impact WQ-10 (CP1) because the extent of the effect of CP4 on sediment would be similar to that for CP1. For the same reasons as described for Impact WQ-10 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-11 (CP4): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Analysis of temperature modeling results indicates that CP4 would improve compliance with the temperature requirements on the Sacramento River because of the increased depth of the cold-water pool in Shasta Lake and the associated enhanced ability to regulate water temperature releases to the upper Sacramento River. Therefore, the impact of CP4 on water quality measured as temperature would be beneficial.

CP4 would increase the ability of Shasta Dam to release cold water and regulate water temperature in the upper Sacramento River, primarily in dry and critically dry years. Raising Shasta Dam 18.5 feet would increase the cold-water pool and benefit seasonal water temperatures along the upper Sacramento River. This section focuses on compliance with water quality standards for temperature. For an analysis of temperature effects on fisheries and aquatic habitat, see Chapter 11, “Fisheries and Aquatic Ecosystems.”

Analysis of temperature modeling results indicates that CP4 would have a beneficial effect on temperature within the upper Sacramento River with a measurable decrease in average monthly water temperature during summer months under both existing and future conditions. For instance, at the Balls Ferry compliance station in September, average monthly water temperature would be reduced by 1.2$^{o}$F. During October at Balls Ferry, the average monthly temperature would decrease by 1.6$^{o}$F. For more information on modeling results and monthly water temperature, see Chapter 11, “Fisheries and Aquatic Ecosystems.”

Decreased temperatures would improve compliance with the temperature objectives for the upper Sacramento River in the 2004 BO. Analysis of modeling results indicates that CP4 would reduce temperature exceedences at Balls Ferry by 37 percent under existing conditions and 40 percent under future conditions. At the Bend Bridge compliance station, CP4 would reduce temperature exceedences by 13-percent under existing conditions and 15 percent under future conditions. Table 7-6 summarizes the temperature modeling results.

CP4 would have the greatest beneficial effect on water temperature of all alternatives evaluated. Based on this analysis, effects of CP4 on water quality measured as temperature would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-12 (CP4): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Long-term operation of the project could result in water quality effects on the upper Sacramento River in regard to metals as a result of erosional processes to historic mining and smelting operation features. This impact would be potentially significant.

This impact is similar to Impact WQ-12 (CP1) because the extent of the effect of CP4 on metals would be similar to that for CP1. For the same reasons as described for Impact WQ-12 (CP1), this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Lower Sacramento River and Delta and CVP/SWP Service Areas**

*Impact WQ-13 (CP4): Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction is not anticipated to affect water quality conditions in the extended study area. This impact would be less than significant.

This impact would be similar to Impact WQ-13 (CP1). For the same reasons as described for Impact WQ-13 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-14 (CP4): Temporary Construction-Related Temperature Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-14 (CP1). For the same reasons as described for Impact WQ-14 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-15 (CP4): Temporary Construction-Related Metal Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be similar to Impact WQ-15 (CP1). For the same reasons as described for Impact WQ-15 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-16 (CP4): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* Project implementation could affect water quality in the extended study area, but effects would diminish with distance. This impact would be less than significant.

This impact would be similar to Impact WQ-16 (CP1). For the same reasons described for Impact WQ-16 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-17 (CP4): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact would be similar to Impact WQ-17 (CP1). For the same reasons as described for Impact WQ-17 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-18 (CP4): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact would be similar to Impact WQ-18 (CP1). For the same reasons described for Impact WQ-18 (CP1), this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-19a (CP4): Delta Salinity on the Sacramento River at Collinsville* Operations for CP4 would result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 10 percent; this would be within the range of natural variability. This impact would be less than significant.

This impact would be the same as Impact WQ-19a (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19b (CP4): Delta Salinity on the Sacramento River at Jersey Point* On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in an average year. Moreover, CP4 would not increase the EC at Jersey Point. This impact would be less than significant.

This impact would be the same as Impact WQ-19b (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19c (CP4): Delta Salinity on the Sacramento River at Emmaton* On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis; moreover, CP4 would not increase the EC at Emmaton during this period by more than 0.2 percent. This impact would be less than significant.

This impact would be the same as Impact WQ-19c (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19d (CP4): Delta Salinity on the Old River at Rock Slough* On an average annual basis, all months except October through January under both the

Existing Condition and Future Condition would be less than 150 mg/L. In dry and critical years, only October and November would exceed the standard under the Existing Condition, and October through February would exceed the standard in the Future Condition. In average annual years, CP4 would not increase chlorides by more than 1.2 percent, and even in that instance, the standard would be met. For dry and critical years, larger increases in chlorides would occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. This impact would be less than significant.

This impact would be the same as Impact WQ-19d (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19e (CP4): Delta Salinity on the Delta-Mendota Canal at Jones Pumping Plant* The water quality requirement on the Delta-Mendota Canal at Jones Pumping Plant has two components, a chloride requirement and an EC requirement. CP4 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

This impact would be the same as Impact WQ-19e (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19f (CP4): Delta Salinity on the West Canal at Clifton Court Forebay* The 250 mg/L chloride concentration at the West Canal would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP4 than under the basis of comparisons. CP4 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

This impact would be the same as Impact WQ-19f (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19g (CP4): Delta Salinity on the San Joaquin River near Vernalis* On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP4 would not measurably change the EC on the San Joaquin River at Vernalis. This impact would be less than significant.

This impact would be the same as Impact WQ-19g (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19h (CP4): Delta Salinity on the San Joaquin River at Brandt Bridge* Impact WQ-19h (CP4) would be the same as Impact WQ-19g (CP4). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years.

Moreover, CP4 would not measurably change EC on the San Joaquin River at Brandt Bridge. This impact would be less than significant.

This impact would be the same as Impact WQ-19h (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19i (CP4): Delta Salinity on the Old River near the Middle River*
Impact WQ-19i (CP4) would be similar to Impact WQ-19g (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP4 would not measurably change EC on the Old River near the Middle River. This impact would be less than significant.

This impact would be the same as Impact WQ-19i (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19j (CP4): Delta Salinity on the Old River near Tracy Road Bridge*
Impact WQ-19j (CP4) would be similar to Impact WQ-19j (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP4 would not measurably change EC on the Old River at Tracy Road Bridge. This impact would be less than significant.

This impact would be the same as Impact WQ-19j (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-20 (CP4): X2 Position* CP4 would not change average monthly X2 in either average years or in dry and critical years by more than 0.1 km under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP4 would not increase the amount out of compliance. This impact would be less than significant.

This impact would be the same as Impact WQ-20 (CP1) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

#### *CP5 – 18.5-Foot Dam Raise, Combination Plan*

CP5 would address both the primary and secondary planning objectives. This alternative involves enlarging Shasta Dam 18.5 feet, which is consistent with the objectives of the 2000 CALFED ROD, and also includes the common features mentioned in CP1. CP5 also involves (1) implementing environmental restoration features along the lower reaches of major tributaries to Shasta Lake, (2) constructing shoreline fish habitat around Shasta Lake, and (3) constructing either additional or improved recreation features at various locations around Shasta Lake to increase the value of the recreational experience. CP5 would differ from the No-Action Alternative primarily through a 634-TAF enlargement of Shasta Lake with additional recreation facilities at Shasta Lake and environmental restoration to the lower ends of the Shasta Lake tributaries.

In addition, CP5, like CP4, would include riparian, floodplain, and side channel habitat restoration activities at Reading Island.

**Shasta Lake and Vicinity**

*Impact WQ-1 (CP5): Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-1 (CP3). However, CP5 includes several ecosystem restoration projects that would require temporary construction-related activities, as described in Chapter 2, "Alternatives."

Although the environmental protection measures and BMPs described in Chapter 2, "Alternatives," are intended to reduce the potential effects of introducing sediment into Shasta Lake and its tributaries, CP5 would affect water quality by increasing the levels of turbidity and suspended sediment in the receiving waters at levels that could be inconsistent with the Basin Plan. These increased levels of turbidity and suspended sediment could affect the beneficial uses of Shasta Lake and/or its tributaries. Therefore, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-2 (CP5): Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact would be identical to Impact WQ-2 (CP3). The nature of inundation and relocation impacts are consistent with those described for CP3. This impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-3 (CP5): Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to WQ-3 (CP1). There would be no construction activities that would disturb locations known to contain elevated metal concentrations in either sediments or the water column. Therefore, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-4 (CP5): Long-Term Sediment Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* This impact is similar to WQ-4 (CP3). Although some ecosystem enhancement measures (i.e., road restoration) are expected to reduce the long-term sediment delivery to Shasta Lake and its tributaries, CP5 would nonetheless result in increased levels of suspended sediment and turbidity that could affect beneficial uses. The amount of sediment that could be delivered is not quantifiable because of the size of the lake and the number of variables that influence sediment transport and delivery. This would be a potentially significant impact. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-5 (CP5): Long-Term Temperature Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* Similar to the discussion in CP3, this alternative would increase storage on a monthly basis although it would vary by water year. Table 7-65 illustrates the monthly change in simulated storage for CP5 as a percent increase above the No-Action Alternative. On average, CP5 represents about a 13 percent increase in the end-of-month storage on an annual basis.

Consistent with the discussion presented under CP3, existing water temperature requirements would typically be met in most years. The simulated end-of-April volume of water with a temperature lower than 52˚F for the No-Action Alternative and the change in CWP volume for CP5 is shown, by SVI, in Table 7-66.

In addition to illustrating the average change in available CWP, this table also shows the influence of climatic conditions on these values. The diversity between water year types, coupled with unique combinations of storage and rainfall would continue to influence the ability to manage storage in Shasta Lake to maximize carryover capacity. Although there is a meaningful increase in active storage and carryover storage of the CWP, this increase is considered to be a less than significant impact. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-6 (CP5): Long-Term Metals Effects That Would Violate Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries* This impact is similar to CP1. The nature of inundation and relocation impacts are consistent with those described for CP3. It would be a potentially significant impact. Mitigation for this impact is proposed in Section 7.3.5.

**Upper Sacramento River (Shasta Dam to Red Bluff)**

*Impact WQ-7 (CP5): Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction would include ground-disturbing activities that could result in soil erosion and sediment effects on the upper Sacramento River. This impact would be potentially significant.

Ground-disturbing activities associated with construction could cause soil erosion and sedimentation of local drainages and eventually the Sacramento River. Construction activities could also discharge waste petroleum products or other construction-related substances that could enter these waterways/facilities in runoff. As described for Impact WQ-7 (CP4), gravel augmentation construction activities could also adversely affect water quality and temporarily increase turbidity and sedimentation downstream from the gravel augmentation sites.

In addition, riparian, floodplain, and side channel habitat restoration activities at Reading Island as part of CP5 would involve breaching the levee using an excavator, loader, and compaction equipment and excavation of approximately 15,650 cubic yards of earthen material for off-site disposal, and potential vegetation clearing along 0.8 mile of channel. Invasive aquatic vegetation would be removed as well. As described for Impact WQ-7 (CP4), construction activities related to habitat restoration and vegetation clearing could adversely affect water quality and temporarily increase turbidity and sedimentation downstream, or result in the accidental discharge of construction-related substances into the river channel. In addition, excavated sediments could be contaminated with pesticides and metals. Development and implementation of a SWPPP as part of the environmental commitments described in Chapter 2, "Alternatives," would reduce potential impacts related to pesticides and metals. However, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-8 (CP5): Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in temperature effects on the upper Sacramento River because changes to water temperature in Shasta Lake and subsequent releases to the Sacramento River would be consistent with typical periodic fluctuations. This impact would be less than significant.

This impact would be similar to Impact WQ-8 (CP1). For the same reasons described for Impact WQ-8 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-9 (CP5): Temporary Construction-Related Metal Effects on the Upper Sacramento River That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction activities are not anticipated to result in water quality effects on the upper Sacramento River related to metals because construction would not disturb locations of known elevated metal concentrations. This impact would be less than significant.

This impact would be similar to Impact WQ-9 (CP1). For the same reasons described for Impact WQ-9 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-10 (CP5): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* No long-term water quality impacts are anticipated in the upper Sacramento River in regard to sediment because modeling results have indicated that CP5 would cause little change in average mean monthly flow, and could cause a decrease in peak flows that are associated with increased sediment transport. This impact would be less than significant.

This impact would be similar to Impact WQ-10 (CP1) because the extent of the effect of CP5 on sediment would be similar to that for CP1. For the same reasons as described for Impact WQ-10 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-11 (CP5): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Analysis of temperature modeling results indicates that CP5 would improve compliance with the temperature requirements on the Sacramento River because of the increased depth of the cold-water pool in Shasta Lake and the associated enhanced ability to regulate water temperature releases to the upper Sacramento River. Therefore, the impact of CP5 on water quality measured as temperature would be beneficial.

CP5 would increase the ability of Shasta Dam to release cold water and regulate water temperature in the upper Sacramento River, primarily in dry and critically dry years. Raising Shasta Dam 18.5 feet would increase the cold-water pool and benefit seasonal water temperatures along the upper Sacramento River. This section focuses on compliance with water quality standards for temperature. For an analysis of temperature effects on fisheries and aquatic habitat, see Chapter 11, “Fisheries and Aquatic Resources.”

CP5 is the same as CP3 for both flow and temperature characteristics. Therefore, separate temperature modeling was not completed for CP5. See Impact WQ-11 (CP3) for a more complete discussion on temperature modeling analysis. For the same reasons as described for Impact WQ-11 (CP3), this impact would be beneficial. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-12 (CP5): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River* Long-term operation of the project could result in water quality effects on the upper Sacramento River in regard to metals as a result of erosional processes to historic mining and smelting operation features. This impact would be potentially significant.

This impact would be similar to Impact WQ-12 (CP1) because the extent of the effect of CP5 on metals would be similar to that for CP1. For the same reasons as described for Impact WQ-12 (CP1), this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

**Lower Sacramento River and Delta and CVP/SWP Service Areas**

*Impact WQ-13 (CP5): Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* Construction is not anticipated to affect water quality conditions in the extended study area. This impact would be less than significant.

This impact is similar to Impact WQ-13 (CP1). For the same reasons as described for Impact WQ-13 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-14 (CP5): Temporary Construction-Related Temperature Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to Impact WQ-14 (CP1). For the same reasons as described for Impact WQ-14 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-15 (CP5): Temporary Construction-Related Metal Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses* This impact is similar to Impact WQ-15 (CP1). For the same reasons as described for Impact WQ-15 (CP1), this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-16 (CP5): Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* Project implementation could affect water quality in the extended study area, but effects would diminish with distance. This impact would be less than significant.

This impact is similar to Impact WQ-16 (CP1). For the same reasons as described for CP1, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-17 (CP5): Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact is similar to Impact WQ-17 (CP1). For the same reasons as described for CP1, this impact would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-18 (CP5): Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area* This impact is similar to Impact WQ-18 (CP1). For the same reasons as described for CP1, this impact would be potentially significant. Mitigation for this impact is proposed in Section 7.3.5.

*Impact WQ-19a (CP5): Delta Salinity on the Sacramento River at Collinsville* Operations for CP5 would result in both increases and decreases in salinity; however, none of the increases would be sufficient to change compliance for the Sacramento River at Collinsville. Similarly, on a percentage basis, all increases in salinity would be less than 10 percent; this would be within the range of natural variability. This impact would be less than significant.

This impact would be the same as Impact WQ-19a (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19b (CP5): Delta Salinity on the Sacramento River at Jersey Point* On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months in an average year. Moreover, CP5 would not increase the EC at Jersey Point. This impact would be less than significant.

This impact would be the same as Impact WQ-19b (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19c (CP5): Delta Salinity on the Sacramento River at Emmaton* On an average monthly basis, for the basis of comparison, EC would meet the requirements in all months on an average annual basis; moreover, CP5 would not increase the EC at Emmaton during this period by more than 0.2 percent. This impact would be less than significant.

This impact would be the same as Impact WQ-19c (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19d (CP5): Delta Salinity on the Old River at Rock Slough* On an average annual basis, all months except October through January under both the Existing Condition and Future Condition would be less than 150 mg/L. In dry and critical years, only October and November would exceed the standard under the Existing Condition, and October through February would exceed the standard in the Future Condition. In average annual years, CP5 would not increase chlorides by more than 1.2 percent, and even in that instance, the standard would be met. For dry and critical years, larger increases in chlorides would occur in November and December under the Existing Condition. However, the change in chloride concentration would not affect compliance with the standard; it would already be exceeded under the basis of comparison. This impact would be less than significant.

This impact would be the same as Impact WQ-19d (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19e (CP5): Delta Salinity on the Delta-Mendota Canal at Jones Pumping Plant* The water quality requirement on the Delta-Mendota Canal at Jones Pumping Plant has two components, a chloride requirement and an EC requirement. CP1 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

This impact would be the same as Impact WQ-19e (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19f (CP5): Delta Salinity on the West Canal at Clifton Court Forebay* The 250 mg/L chloride concentration at the West Canal would not be exceeded on an average annual or dry and critical year basis. Furthermore, chloride concentrations would typically be lower under CP5 than under the basis of comparisons. CP5 would not measurably change EC, and the increases in chloride concentration would be less than 1.0 percent. This impact would be less than significant.

This impact would be the same as Impact WQ-19f (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19g (CP5): Delta Salinity on the San Joaquin River near Vernalis* On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP5 would not measurably change the EC on the San Joaquin River at Vernalis. This impact would be less than significant.

This impact would be the same as Impact WQ-19g (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19h (CP5): Delta Salinity on the San Joaquin River at Brandt Bridge* Impact WQ-19h (CP5) would be the same as Impact WQ-19g (CP5). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP5 would not measurably change EC on the San Joaquin River at Brandt Bridge. This impact would be less than significant.

This impact would be the same as Impact WQ-19h (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19i (CP5): Delta Salinity on the Old River near the Middle River* Impact WQ-19i (CP1) would be similar to Impact WQ-19i (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP1 would not measurably change EC on the Old River near the Middle River. This impact would be less than significant.

This impact would be the same as Impact WQ-19i (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-19j (CP5): Delta Salinity on the Old River near Tracy Road Bridge* Impact WQ-19j (CP5) would be similar to Impact WQ-19j (CP1). On an average monthly basis, for the basis of comparison, EC would meet requirements in all months, in both average years and in dry and critical years. Moreover, CP5 would not measurably change EC on the Old River at Tracy Road Bridge. This impact would be less than significant.

This impact would be the same as Impact WQ-19j (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

*Impact WQ-20 (CP5): X2 Position* CP5 would not change average monthly X2 in either average years or in dry and critical years by more than 0.1 km under either the Existing Condition or Future Condition. While several months may be out of compliance under the bases of comparison, the change resulting from CP5 would not increase the amount out of compliance. This impact would be less than significant.

This impact would be the same as Impact WQ-20 (CP3) and would be less than significant. Mitigation for this impact is not needed, and thus not proposed.

### 7.3.5 Mitigation Measures

Table 7-94 presents a summary of mitigation measures for water quality.

**Table 7-94. Summary of Mitigation Measures for Water Quality**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-1: Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | LOS before Mitigation | NI | PS | PS | PS | PS | PS |
| | Mitigation Measure | None required. | Mitigation Measure WQ-1: Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities. | | | | |
| | LOS after Mitigation | NI | LTS | LTS | LTS | LTS | LTS |
| Impact WQ-2: Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 WQ-3: Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 WQ-4: Long-Term Sediment Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries | LOS before Mitigation | NI | PS | PS | PS | PS | PS |
| | Mitigation Measure | None required. | Mitigation Measure WQ-4: Implement Mitigation Measure WQ-1 (CP1): Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities. | | | | |
| | LOS after Mitigation | NI | LTS | LTS | LTS | LTS | LTS |

**Table 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-5: Long-Term Temperature Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries | 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 WQ-6: Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries | LOS before Mitigation | NI | PS | PS | PS | PS | PS |
| | Mitigation Measure | None required. | Mitigation Measure WQ-6: Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines. | | | | |
| | LOS after Mitigation | NI | LTS | LTS | LTS | LTS | LTS |
| Impact WQ-7: Temporary Construction-Related Sediment Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | LOS before Mitigation | NI | PS | PS | PS | PS | PS |
| | Mitigation Measure | None required. | Mitigation Measure WQ-7 (CP1–CP3): Implement Mitigation Measure WQ-1 (CP1): Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities. | | | Mitigation Measure WQ-7 (CP4, CP5): Implement Mitigation Measure WQ-1 (CP1): Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities and Gravel Augmentation BMPs. | |
| | LOS after Mitigation | NI | LTS | LTS | LTS | LTS | LTS |

**Table 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-8: Temporary Construction-Related Temperature Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 WQ-9: Temporary Construction-Related Metal Effects on the Upper Sacramento River That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 WQ-10: Long-Term Sediment Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the 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 WQ-11: Long-Term Temperature Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River | LOS before Mitigation | NI | B | B | B | B | B |
| | Mitigation Measure | None required | None needed; thus, none proposed | | | | |
| | LOS after Mitigation | NI | B | B | B | B | B |

**Table 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-12: Long-Term Metals Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River | LOS before Mitigation | NI | PS | PS | PS | PS | PS |
| | Mitigation Measure | None required | Mitigation Measure WQ-12: Implement Mitigation Measure WQ-6 (CP1): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines | | | | |
| | LOS after Mitigation | NI | LTS | LTS | LTS | LTS | LTS |
| Impact WQ-13: Temporary Construction-Related Sediment Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 WQ-14: Temporary Construction-Related Temperature Effects on the Extended Study Area That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 WQ-15: Temporary Construction-Related Metal Effects on the Extended Study Area That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses | 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 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-16: Long-Term Sediment Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area | 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 WQ-17: Long-Term Temperature Effects That Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area | 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 WQ-18: Long-Term Metals Effects That Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area | LOS before Mitigation | NI | PS | PS | PS | PS | PS |
| | Mitigation Measure | Non required | Mitigation Measure WQ-18: Implement Mitigation Measure WQ-6 (CP1): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines | | | | |
| | LOS after Mitigation | NI | LTS | LTS | LTS | LTS | LTS |
| Impact WQ-19a: Delta Salinity on the Sacramento River at Collinsville | 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 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-19b: Delta Salinity on the San Joaquin River at Jersey Point | 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 WQ-19c: Delta Salinity on the Sacramento River at Emmaton | 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 WQ-19d: Delta Salinity on the Old River at Rock Slough | 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 WQ-19e: Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant | 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 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-19f: Delta Water Quality on the West Canal at the Mouth of the Clifton Court Forebay | LOS before Mitigation | LTS | LTS | LTS | LTS | LTS | LTS |
| | Mitigation Measure | None required | None needed; thus, none proposed | | | | |
| | LOS after Mitigation | LTS | LTS | LTS | LTS | LTS | LTS |
| Impact WQ-19g: Delta Salinity on the San Joaquin River at Vernalis | 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 WQ-19h: Delta Salinity on the San Joaquin River at Brandt Bridge | 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 WQ-19i: Delta Salinity on the Old River near the Middle 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 7-94. Summary of Mitigation Measures for Water Quality (contd.)**

| Impact | | No-Action Alternative | CP1 | CP2 | CP3 | CP4 | CP5 |
|---|---|---|---|---|---|---|---|
| Impact WQ-19j: Delta Salinity on the Old River at Tracy Road Bridge | 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 WQ-20: X2 Position | 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 |

Key:
B = Beneficial
LTS = less than significant
NI = no impact
PS = potentially significant

### *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 WQ-2 (CP1), WQ-3 (CP1), WQ-5 (CP1), WQ-8 (CP1) through WQ-11 (CP1), WQ-13 (CP1) through WQ-17 (CP1), WQ-19a (CP1) through WQ-19j (CP1), and WQ-20 (CP1). Mitigation is provided below for the remaining impacts of CP1 on water quality.

**Mitigation Measure WQ-1 (CP1): Prepare and Implement a Stormwater Pollution Prevention Program that Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities** This project is subject to construction-related stormwater permit requirements of the CWA NPDES program. Reclamation will obtain any required permits through the CVRWQCB before any ground-disturbing construction activity. Reclamation will prepare and implement a SWPPP that identifies BMPs to prevent or minimize the introduction of contaminants into surface waters. BMPs for the project could include but are not limited to silt fencing, straw bale barriers, fiber rolls, storm drain inlet protection, hydraulic mulch, and stabilized construction entrance.

The SWPPP will include development of site-specific structural and operational BMPs to prevent and control impacts on runoff quality, measures to be implemented before each storm event, inspection and maintenance of BMPs, and monitoring of runoff quality by visual and/or analytical means.

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

**Mitigation Measure WQ-4 (CP1): Implement Mitigation Measure WQ-1 (CP1) to Reduce Long-Term Effects on Shasta Lake and Its Tributaries Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce long-term effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-4 (CP1) to a less than significant level.

**Mitigation Measure WQ-6 (CP1): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines** Reclamation will prepare and implement a plan to remove or otherwise remediate two sites related to historic mining activities that have the potential to introduce metals into Shasta Lake, a Section 303(d)-listed water body. This plan will include requirements to coordinate with Federal, State, and local agencies and landowners to ensure that measures taken will reduce the potential for a discharge of metals into Shasta

Lake. Reclamation will obtain any required permits, approvals, and authorizations before any ground-disturbing remediation activity occurs.

Implementation of this mitigation measure would reduce Impact WQ-6 (CP1) to a less than significant level.

**Mitigation Measure WQ-7 (CP1): Implement Mitigation Measure WQ-1 (CP1) to Reduce Temporary Construction-Related Effects on the Upper Sacramento River Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce temporary construction-related effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-7 (CP1) to a less than significant level.

**Mitigation Measure WQ-12 (CP1): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Upper Sacramento River** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-12 (CP1) to a less than significant level.

**Mitigation Measure WQ-18 (CP1): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Extended Study Area** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-18 (CP1) to a less than significant level.

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

No mitigation measures are needed for Impacts WQ-2 (CP2), WQ-3 (CP2), WQ-5 (CP2), WQ-8 (CP2) through WQ-11 (CP2), WQ-13 (CP2) through WQ-17 (CP2), WQ-19a (CP2) through WQ-19j (CP2), and WQ-20 (CP2). Mitigation is provided below for the remaining impacts of CP2 on water quality.

**Mitigation Measure WQ-1 (CP2): Prepare and Implement a Stormwater Pollution Prevention Plan that Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities** This mitigation measure is identical to Mitigation Measure WQ-1 (CP1). Implementation of this mitigation measure would reduce Impact WQ-1 (CP2) to a less than significant level.

**Mitigation Measure WQ-4 (CP2): Implement Mitigation Measure WQ-1 (CP1) to Reduce Long-Term Effects on Shasta Lake and Its Tributaries Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce long-term effects related to sediment.

Implementation of this mitigation measure would reduce Impact WQ-4 (CP2) to a less than significant level.

**Mitigation Measure WQ-6 (CP2): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines** This mitigation measure is identical to Mitigation Measure WQ-6 (CP1). Implementation of this mitigation measure would reduce Impact WQ-6 (CP2) to a less than significant level.

**Mitigation Measure WQ-7 (CP2): Implement Mitigation Measure WQ-1 (CP1) to Reduce Temporary Construction-Related Effects on the Upper Sacramento River Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce temporary construction-related effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-7 (CP2) to a less than significant level.

**Mitigation Measure WQ-12 (CP2): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Upper Sacramento River** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-12 (CP2) to a less than significant level.

**Mitigation Measure WQ-18 (CP2): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Extended Study Area** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-18 (CP2) to a less than significant level.

***CP3 – 18.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply***
No mitigation measures are needed for Impacts WQ-2 (CP3), WQ-3 (CP3), WQ-5 (CP3), WQ-8 (CP3) through WQ-11 (CP3), WQ-13 (CP3) through WQ-17 (CP3), WQ-19a (CP3) through WQ-19j (CP3), and WQ-20 (CP3). Mitigation is provided below for the remaining impacts of CP3 on water quality.

**Mitigation Measure WQ-1 (CP3): Prepare and Implement a Stormwater Pollution Prevention Plan that Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities** This mitigation measure is identical to Mitigation Measure WQ-1 (CP1). Implementation of this mitigation measure would reduce Impact WQ-1 (CP3) to a less than significant level.

**Mitigation Measure WQ-4 (CP3): Implement Mitigation Measure WQ-1 (CP1) to Reduce Long-Term Effects on Shasta Lake and Its Tributaries Related to Sediment** Reclamation will implement Mitigation Measure WQ-1

(CP1) as described above to reduce long-term effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-4 (CP3) to a less than significant level.

**Mitigation Measure WQ-6 (CP3): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines** This mitigation measure is identical to Mitigation Measure WQ-6 (CP1). Implementation of this mitigation measure would reduce Impact WQ-6 (CP3) to a less than significant level.

**Mitigation Measure WQ-7 (CP3): Implement Mitigation Measure WQ-1 (CP1) to Reduce Temporary Construction-Related Effects on the Upper Sacramento River Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce temporary construction-related effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-7 (CP3) to a less than significant level.

**Mitigation Measure WQ-12 (CP3): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Upper Sacramento River** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-12 (CP3) to a less than significant level.

**Mitigation Measure WQ-18 (CP3): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Extended Study Area** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-18 (CP3) to a less than significant level.

#### *CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability*

No mitigation measures are needed for Impacts WQ-2 (CP4), WQ-3 (CP4), WQ-5 (CP4), WQ-8 (CP4) through WQ-11 (CP4), WQ-13 (CP4) through WQ-17 (CP4), WQ-19a (CP4) through WQ-19j (CP4), and WQ-20 (CP4). Mitigation is provided below for the remaining impacts of CP4 on water quality.

**Mitigation Measure WQ-1 (CP4): Prepare and Implement a Stormwater Pollution Prevention Plan that Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities** This mitigation measure is identical to Mitigation Measure WQ-1 (CP1). Implementation of this mitigation measure would reduce Impact WQ-1 (CP4) to a less than significant level.

**Mitigation Measure WQ-4 (CP4): Implement Mitigation Measure WQ-1 (CP1) to Reduce Long-Term Effects on Shasta Lake and Its Tributaries Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce long-term effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-4 (CP4) to a less than significant level.

**Mitigation Measure WQ-6 (CP4): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines** This mitigation measure is identical to Mitigation Measure WQ-6 (CP1). Implementation of this mitigation measure would reduce Impact WQ-6 (CP4) to a less than significant level.

**Mitigation Measure WQ-7 (CP4): Implement Mitigation Measure WQ-1 (CP1) and Gravel Augmentation BMPs to Reduce Temporary Construction-Related Effects on the Upper Sacramento River Related to Sediment** Reclamation will implement (a) Mitigation Measure WQ-1 (CP1) as described above; and (b) specific BMPs for the gravel augmentation program. Gravel augmentation BMPs will include, but will not be limited to:

- **Construction Work Windows –** All gravel augmentation construction activities will be conducted outside of the flood season (e.g., June 15 to September 15).
- **Source and Handle Gravel So As to Minimize Potential Water Quality Impacts –** Gravel will be sorted and transported in a manner that minimizes potential water quality impacts (e.g., management of fine sediments). Gravel will be washed at least once and have a cleanliness value of 85 or higher based on Caltrans Test No. 227. Gravel will also be completely free of oils, clay, debris, and organic material.
- **Minimize Potential Impacts Associated with Equipment Contaminants –** For in-river work, all equipment will be steam cleaned every day to remove hazardous materials before the equipment enters the water.
- **Implement Feasible Spill Prevention and Hazardous Materials Management –** The accidental release of chemicals, fuels, lubricants, and non-storm drainage water into channels will be prevented to the extent feasible. Spill prevention kits will always be in close proximity when using hazardous materials (e.g., crew trucks and other logical locations). Feasible measures will be implemented to ensure that hazardous materials are properly handled and the quality of aquatic resources is protected by all reasonable means. No fueling will be done within the ordinary high-water mark or immediate floodplain, unless equipment stationed in these locations is not readily relocated (i.e.,

pumps, generators). For stationary equipment that must be fueled on site, containments will be provided in such a manner that any accidental spill of fuel will not be able to enter the water or contaminate sediments that may come in contact with water. Any equipment that is readily moved out of the channel will not be fueled in the channel or immediate floodplain. All fueling done at the construction site will provide containment to the degree that any spill shall be unable to enter the channel or damage wetland or riparian vegetation. No equipment servicing will be done within the ordinary high-water mark or immediate floodplain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps, generators). Additional BMPs designed to avoid spills from construction equipment and subsequent contamination of waterways will also be implemented.

- **Minimize Potential Impacts Associated with Access and Staging –** Existing access roads will be used. Equipment staging areas will be located outside of the ordinary high-water mark and away from sensitive resources.

- **Remove Temporary Fills as Appropriate –** Temporary fill, such as for access, side channel diversions, and/or side channel cofferdams, will be completely removed upon the completion of construction.

Implementation of this mitigation measure would reduce Impact WQ-1 (CP4) to a less than significant level.

**Mitigation Measure WQ-12 (CP4): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Upper Sacramento River** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-12 (CP4) to a less than significant level.

**Mitigation Measure WQ-18 (CP4): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Extended Study Area** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-18 (CP4) to a less than significant level.

#### *CP5 – 18.5-Foot Dam Raise, Combination Plan*

No mitigation measures are needed for Impacts WQ-2 (CP5), WQ-3 (CP5), WQ-5 (CP5), WQ-8 (CP5) through WQ-11 (CP5), WQ-13 (CP5) through WQ-17 (CP5), WQ-19a (CP5) through WQ-19j (CP5), and WQ-20 (CP5). Mitigation is provided below for the remaining impacts of CP5 on water quality.

**Mitigation Measure WQ-1 (CP5): Prepare and Implement a Stormwater Pollution Prevention Plan That Minimizes the Potential Contamination of Surface Waters, and Comply with Applicable Federal Regulations Concerning Construction Activities** This mitigation measure is identical to Mitigation Measure WQ-1 (CP1). Implementation of this mitigation measure would reduce Impact WQ-1 (CP5) to a less than significant level.

**Mitigation Measure WQ-4 (CP5): Implement Mitigation Measure WQ-1 (CP1) to Reduce Long-Term Effects on Shasta Lake and Its Tributaries Related to Sediment** Reclamation will implement Mitigation Measure WQ-1 (CP1) as described above to reduce long-term effects related to sediment. Implementation of this mitigation measure would reduce Impact WQ-4 (CP5) to a less than significant level.

**Mitigation Measure WQ-6 (CP5): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines** This mitigation measure is identical to Mitigation Measure WQ-6 (CP1). Implementation of this mitigation measure would reduce Impact WQ-6 (CP5) to a less than significant level.

**Mitigation Measure WQ-7 (CP5): Implement Mitigation Measure WQ-1 (CP1) and Gravel Augmentation BMPs to Reduce Temporary Construction-Related Effects on the Upper Sacramento River Related to Sediment** This mitigation measure is identical to Mitigation Measure WQ-7 (CP4). Implementation of this mitigation measure would reduce Impact WQ-7 (CP5) to a less than significant level.

**Mitigation Measure WQ-12 (CP5): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Upper Sacramento River** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-12 (CP5) to a less than significant level.

**Mitigation Measure WQ-18 (CP5): Implement Mitigation Measure WQ-6 (CP1) to Reduce Long-Term Metals Effects on the Extended Study Area** Reclamation will implement Mitigation Measure WQ-6 (CP1) as described above to reduce long-term metals effects. Implementation of this mitigation measure would reduce Impact WQ-18 (CP5) to a less than significant level.

### 7.3.6 Cumulative Effects

Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences” discusses the overall methodology for cumulative impacts of the project alternatives, including the relationship to the CALFED programmatic cumulative impacts analysis, qualitative and quantitative assessment, past and future actions in the study area, and significance criteria.

This section analyzes the overall cumulative impacts of the project alternatives with other past, present, and reasonably foreseeable future projects that would produce related impacts.

The projects listed in the quantitative analysis section of Chapter 3, “Considerations for Describing the Affected Environment and Environmental Consequences” are included in the 2030 level of development alternatives above. Accordingly, quantitative effects of the projects combined with the SLWRI alternatives are described in the Section 7.3, “Environmental Consequences and Mitigation Measures.” The discussion below focuses on the qualitative effect of the SLWRI alternatives and the other past, present, and reasonably foreseeable future projects.

Given the substantial degradation in water quality in the study areas when considering past, present, and reasonably foreseeable projects, and as identified in the existing conditions presented in this chapter, it is concluded that there is a significant cumulative impact on water quality overall under both existing and future conditions. These cumulative impacts are occurring without the proposed action. Several factors could substantially affect water quality in both the primary and extended study areas as an outcome of reasonably foreseeable future actions, but the potential effects are highly uncertain and may result in either a beneficial or adverse impact on water quality in the study areas.

The effect of climate change on operations at Shasta Lake could potentially result in changes to water quality. As described in the Climate Change Projection Appendix, climate change could result in higher inflows to Shasta Lake in the winter and early spring due to a shift from precipitation falling as snow to rain. This change could result in both higher Shasta Lake releases in the winter and spring to manage the increased potential for flood events, and an increase in water temperature for Shasta Lake inflows. A corresponding decrease in Shasta Lake releases in the summer and fall and a decrease in operable cold-water volume could result in warmer flows downstream.

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

CP1 would not result in adverse changes to sediment, metals, and temperature, and therefore would not make a cumulatively considerable incremental contribution to an overall significant cumulative impact on water quality.

Without mitigation, CP1 could cause potentially significant effects on water quality in the primary study area. These effects could be caused temporarily or for the short term by construction-related activities that cause sediment, petroleum, or other substances to enter waterways in runoff. Mitigation measures would eliminate these effects or reduce them to a less than significant level.

CP1 would also affect water quality by increasing the volume of water in the reservoir and by altering downstream river flows. The effects on water quality resulting from these hydrologic alterations would be long term and much greater than the temporary and short-term effects related to construction.

Hydrologic modeling output predicts that hydrologically, CP1 would result in a small change in reservoir storage and minimal change in river flows relative to the No-Action Alternative. A small increase in the volume of water stored in the reservoir under CP1 could result in additional inputs of metals from shoreline erosion of historical mining deposits and would result in a slight dilution of inputs of sediment and metals relative to existing and future No-Action conditions. The potential for additional inputs of metals would be substantially reduced or eliminated by Mitigation Measure WQ-6 (CP1). Changes in Sacramento River flows can be best characterized as a small decrease in monthly average winter and early spring flows in some years as measured below Keswick Dam, RBDD, Wilkins Slough, and Freeport, and a slight increase in summer flows in most years. This redistribution of flows would have little effect on water quality as measured by metals, sediment, salinity, and temperature.

The small reduction in winter flows caused by CP1 would slightly reduce potential sediment loading and discharge rates, and would also slightly reduce transport of heavy metals. Therefore, the water quality impact of CP1 related to metals and sediment would not be adverse.

Monthly mean water temperatures at all modeling locations (below Shasta Dam, below Keswick Dam, above Bend Bridge, and above Red Bluff) within the upper Sacramento River under CP1 would be essentially equivalent or slightly decreased (i.e., beneficial). Therefore, the effects of CP1 on water quality measured as water temperature would be beneficial, not adverse.

Implementing Mitigation Measure WQ-1 (CP1) would eliminate adverse effects from CP1, and the incremental contribution of CP1 to cumulative effects on water quality would no longer be cumulatively considerable. In summary, effects of CP1 on water quality measured as water temperature, metals, and sediment would be less than significant, and CP1 would not cause an incremental cumulatively considerable contribution to an overall significant cumulative impact on water quality in the primary study area.

In the extended study area, CP1 could also influence water quality in the Delta by altering the quality, volume, or timing of Sacramento River flows. However, because changes in Sacramento River flows relative to the No-Action Alternative would be minimal and effects would diminish with distance from Shasta Dam, the effects would be very minor. (Water quality effects are attenuated by multiple factors, including flow from tributaries, stormwater runoff, and municipal and agricultural discharges.) Furthermore, the Central Valley's reservoirs and diversions are managed as a single integrated system, and the guidelines for this system, which are described in the CVP OCAP, have been designed to maintain standards for Delta inflow and water quality. Therefore, water quality impacts of CP1 at the Delta would not make a cumulatively considerable incremental contribution to the overall significant cumulative impact on Delta water quality.

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 releases with potentially increased water temperatures at other times. The additional storage associated with CP1 could potentially reduce these effects, allowing Shasta Lake to capture some of the increased runoff in the winter and early spring for both cold-water storage and release in summer and fall. This would benefit both Sacramento River water temperatures and Delta water quality. Potential impacts associated with Sacramento River water temperatures and Delta water quality would be less than significant under CP1. Therefore, even with the addition of anticipated effects of climate change, CP1 would not have a significant cumulative effect, and could be potentially beneficial.

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

The cumulative effects of CP2 would be similar to those of CP1, except that the greater increase in reservoir storage and river flow alteration under CP2 would result in greater beneficial effects on water temperature in the upper Sacramento River. Effects on sediments and metals in the Upper Sacramento River, and on Delta water quality would be effectively the same as CP1. Therefore, water quality impacts of CP2 would not make a cumulatively considerable incremental contribution to the overall significant cumulative water quality impact in the primary study area or extended study area, including the Delta.

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 releases with potentially increased water temperatures at other times. The additional storage associated with CP2 could potentially reduce these effects, allowing Shasta Lake to capture some of the increased runoff in the winter and early spring for both cold-water storage and release in summer and fall. This would benefit both Sacramento River water temperatures and Delta water quality. Potential impacts associated with Sacramento River water temperatures and Delta water quality would be less than significant under CP2. Therefore, even with the addition of anticipated effects of climate change, CP2 would not have a significant cumulative effect, and could be potentially beneficial.

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

The cumulative effects of CP3 would be similar to those of CP1 and CP2, except that the greater increase in reservoir storage and river flow alteration under CP3 would result in greater beneficial effects on water temperature in the upper Sacramento River. Effects on sediments and metals in the Upper Sacramento River, and on Delta water quality would be effectively the same as CP1. Therefore, water quality impacts of CP3 would not make a cumulatively considerable incremental contribution to the overall significant cumulative water quality impact in the primary study area or extended study area, including the Delta.

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 releases with potentially increased water temperatures at other times. The additional storage associated with CP3 could potentially reduce these effects, allowing Shasta Lake to capture some of the increased runoff in the winter and early spring for both cold-water storage and release in summer and fall. This would benefit both Sacramento River water temperatures and Delta water quality. Potential impacts associated with Sacramento River water temperatures and Delta water quality would be less than significant under CP3. Therefore, even with the addition of anticipated effects of climate change, CP3 would not have a significant cumulative effect, and could be potentially beneficial.

#### *CP4 – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability*

With the exception of water quality measured as water temperature, the cumulative effects of CP4 would be the same as those of CP1. Effects of CP4 on water quality measured as water temperature would be beneficial and greater than those of other alternatives.

Therefore, water quality impacts of CP4 would not make a cumulatively considerable incremental contribution to the overall significant cumulative water quality impact in the primary study area or extended study area, including the Delta.

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 releases with potentially increased water temperatures at other times. The additional storage associated with CP4 could potentially reduce these effects, allowing Shasta Lake to capture some of the increased runoff in the winter and early spring for both cold-water storage and release in summer and fall. This would benefit both Sacramento River water temperatures and Delta water quality. Potential impacts associated with Sacramento River water temperatures and Delta water quality would be less than significant under CP4. Therefore, even with the addition of anticipated effects of climate change, CP4 would not have a significant cumulative effect, and could be potentially beneficial.

### *CP5 – 18.5-Foot Dam Raise, Combination Plan*

With the exception of water quality measured as water temperature, the cumulative effects of CP5 would be the same as those of CP1. Effects of CP5 on water quality measured as water temperature would be beneficial and effectively the same as CP3. Therefore, water quality impacts of CP5 would not make a cumulatively considerable incremental contribution to the overall significant cumulative water quality impact in the primary study area or extended study area, including the Delta.

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 releases with potentially increased water temperatures at other times. The additional storage associated with CP5 could potentially reduce these effects, allowing Shasta Lake to capture some of the increased runoff in the winter and early spring for both cold-water storage and release in summer and fall. This would benefit both Sacramento River water temperatures and Delta water quality. Potential impacts associated with Sacramento River water temperatures and Delta water quality would be less than significant under CP5. Therefore, even with the addition of anticipated effects of climate change, CP5 would not have a significant cumulative effect, and could be potentially beneficial.