Long-Term Operation – Final Environmental Impact Statement

Appendix C – Facilities Description

November 2024

Contents

Tables

Figures

Appendix C Facilities Description

C.1 Introduction

This appendix provides the geographical location, authorization, operational specifications, water and power contracts, and other pertinent information for facilities of the Central Valley Project (CVP) and State Water Project (SWP).

C.1.1 Overview of the CVP

The Sacramento River watershed receives two-thirds to three-quarters of northern California's precipitation, though it only has one-third to one-quarter of the land. The San Joaquin River watershed occupies two-thirds to three-quarter of northern California's land, but only collects one-third to one-quarter of the precipitation. The Sacramento Valley suffers from floods, while the San Joaquin Valley alternates between periods of floods then drought.

A report on the "Sacramento Project" in 1904, first connected the U.S. Reclamation Service (initial name for the United States Department of the Interior Bureau of Reclamation [Reclamation]) to water problems in the Central Valley, but that connection remained limited. In a 1919 letter to California Governor William Stephens, Colonel Robert Bradford Marshall, Chief Geographer for the U.S. Geological Survey, proposed a plan to build storage reservoirs along the Sacramento River system, and transfer water from the Sacramento Valley to the San Joaquin Valley via two large canals lying on both sides of the Sacramento River. Central Valley Project Documents, Committee on Interior and Insular Affairs, House of Representatives, 1956, p. 139 - 150.

The California Legislature authorized the future Central Valley Project as a state project in 1933. The act authorized the sale of "revenue" bonds not to exceed $170 million. Even with the authorized revenue bonds, California found itself unable to finance the project nor get it approved for loans and grants under the National Recovery Act.

In 1935, the Committee on Rivers and Harbors of the House of Representatives recommended $12 million of federal money for construction of Kennett Dam (initial name for Shasta Dam) because of the national benefits to navigation and flood control on the Sacramento River (Central Valley Documents 1956:544–549). Section 1 of the Act of August 30, 1935, 49 Stat. 1028, approved the War Department report contained in Rivers and Harbors Committee Document Numbered 35, 73rd Congress. It authorized the Secretary of War to make a contribution of $12 million to the cost of Kennett Dam on the upper reaches of the Sacramento River which had been proposed at that time for construction by the Water Project Authority of the State of California. On September 10, 1935, President Franklin Delano Roosevelt transferred funds appropriated under the Emergency Relief Appropriation Act of 1935 to the Secretary of the Interior, Harold LeClair Ickes, for construction of, under Federal Reclamation laws, Friant Dam on the San Joaquin River and related features as part of the CVP. On December 2, 1935, the

President approved the finding of feasibility report of the Secretary of the Interior, dated November 26, 1935, thereby authorizing construction of the CVP as a Federal reclamation project under section 4 of the Act of June 25, 1910, and subsection B, section 4, of the Act of December 5, 1924 (Fact Finders' Act). The principal features of the project listed in the report were the Kennett Dam unit (subsequently renamed Shasta Dam), the Contra Costa conduit, San Joaquin pumping system, Friant Dam and Reservoir, Friant-Kern Canal, and Madera Canal.[1]

In 1937, Section 2 of the Act of August 26, 1937, 50 Stat. 844, the 1937 Rivers and Harbors Act, transferred authority from the Secretary of War to the Secretary of the Interior. It also reauthorized the CVP "for the purposes of improving navigation, regulating the flow of the San Joaquin River and the Sacramento River, controlling floods, providing for storage and for the delivery of the stored waters thereof, for construction under the provisions of the Federal Reclamation laws of such distribution systems as the Secretary of the Interior deems necessary in connection with lands for which said stored waters are to be delivered, for the reclamation of arid and semiarid lands and lands of Indian reservations, and other beneficial uses, and for the generation and sale of electric energy as a means of financially aiding and assisting such undertakings and in order to permit the full utilization of the works constructed to accomplish the aforesaid purposes." It further provided "the provisions of the Reclamation law, as amended, shall govern the repayment of expenditures and the construction, operation, and maintenance of the dams, canals, power plant, pumping plants, transmission lines, and incidental works deemed necessary to said entire project, and the Secretary of the Interior may enter into repayment contracts, and other necessary contracts, with State agencies, authorities, associations, persons, and corporations, either public or private, including all agencies with which contracts are authorized under the Reclamation law, and may acquire by proceedings in eminent domain, or otherwise, all lands, rights-of-way, water rights, and other property necessary for said purposes." It also provided that "the said dam and reservoirs shall be used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power."[2]

Pursuant to the following Acts of Congress, Divisions and Units were added for inclusion as a part of, or for integrated operation with, the CVP: (1) American River Basin Development, Act of October 14, 1949; (2) Sacramento Valley Canals, Act of September 26, 1950; (3) Trinity River Division, Act of August 12, 1955; (4) San Luis Unit, Act of June 3, 1960; (5) New Melones Project, Act of October 23, 1962; (6) Auburn- Folsom South Unit, Act of September 2, 1965; and, (7) San Felipe Division, Act of August 27, 1967. Attachment 1, *CVP Public Laws*, includes copies of these and other relevant authorizing legislation for the Central Valley Project.

The CVP purposes were modified by statute several times, including for the Waterfowl Management Act of August 27, 1954, which first added fish and wildlife as a purpose of the CVP. The most recent amendment comes from Section 3406(a) of the 1992 Central Valley Project Improvement Act (CVPIA), Title 34, P.L. 102-575, which provides for the CVP purpose to be: *That the said dam and reservoirs shall be used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and fish and wildlife*

[1] Federal Reclamation and Related Laws Annotated, Volume I, Explanatory Notes, page 584
[2] Federal Reclamation and Related Laws Annotated, Volume I, page 583

mitigation, protection and restoration purposes and, third, for power and fish and wildlife enhancement.

Delivery of water from the CVP is made pursuant to contracts between the United States and the various water users within the Divisions and Units of the CVP. These contracts are required by statutes that form an integral part of the overall Reclamation law that governs construction and operation of reclamation projects, including the CVP. The primary types of contracts are settlement and exchange contracts, water service and repayment contracts, refuge contracts, and Warren Act contracts.[3] In general, the lands to be served by CVP water receive that water from a source within the CVP Division in which the lands are located. However, for lands south of the Sacramento–San Joaquin River Delta (Delta), primarily within the San Luis Unit of the CVP, the primary source is from the Sacramento Division.

Major CVP Facilities include:

- Trinity Division
    - Trinity Dam, Reservoir, and Powerplant
    - Trinity River Fish Hatchery
    - Lewiston Dam, Lake, and Powerplant
    - Clear Creek Tunnel
    - Judge Francis Carr Powerhouse
    - Whiskeytown Dam and Lake
    - Spring Creek Tunnel
    - Spring Creek Debris Dam, Reservoir, and Powerplant
    - Whiskeytown Dam and Lake
    - Buckhorn Dam and Reservoir
- Shasta Division
    - Shasta Dam, Lake and Powerplant

[3] Section 9 of the 1939 Act authorized the Secretary of the Interior to enter into water service and repayment contracts for the delivery of Project Water for irrigation and municipal and industrial purposes. In 2016, through Section 4011 of the Water Infrastructure Improvements for the Nation Act, Congress directed Reclamation, if requested by the contractor, to convert water service contracts to repayment contracts. Section 14 of the 1939 Act authorized the Secretary, for the construction and operation of the Project, to enter into settlement and exchange contracts for the exchange or replacement of water or water rights, which settled disputes with water users that claimed water rights senior to the United States' water rights for the CVP. Section 3406(d) of the CVPIA authorized the Secretary to enter into refuge agreements that provide for the delivery of water supplies to certain units of the National Wildlife Refuge System in California's Central Valley, certain state wildlife management areas, and Grasslands Resources Conservation District. The Act of February 21, 1911, known as the Warren Act, authorized the Secretary to enter into contracts for the storage and conveyance of non-Project water through excess capacity at Reclamation facilities.

- Livingston Stone National Fish Hatchery
- Keswick Dam, Reservoir and Powerplant
- Coleman National Fish Hatchery

- Sacramento River Division
  - *Sacramento Canals Unit*
    - Red Bluff Pumping Plant
    - Tehama-Colusa Canal
    - Corning Canal
  - *Black Butte Unit*
    - Black Butte Dam and Reservoir

- American River Division
  - Folsom Unit
    - Folsom Dam, Lake and Powerplant
    - Nimbus Dam, Lake Natoma and Nimbus Powerplant
    - Nimbus Fish Hatchery
    - Auburn-Folsom South Unit
  - Folsom-South Canal

- Friant Division
  - Friant Dam and Millerton Lake
  - Madera Canal
  - Friant-Kern Canal

- Eastside Division
  - New Melones Dam, Reservoir, and Powerplant

- Delta Division
  - C.W. Jones Pumping Plant
  - Tracy Fish Collection Facility
  - Delta Cross Channel
  - Delta-Mendota Canal (DMC)
  - DMC-California Aqueduct Intertie Pumping Plant

- Contra Costa Facilities - Rock Slough Intake and Canal

- West San Joaquin Division
  - *San Luis Unit*
    - B.F Sisk (San Luis) Dam and San Luis Reservoir
    - O'Neill Dam and Forebay
    - O'Neill Pumping-Generating Plant
    - William R. Gianelli Pumping-Generating Plant
    - Dos Amigos Pumping Plant
    - Pleasant Valley Pumping Plant
    - Coalinga Canal
    - Los Banos and Little Panoche Detention Dams and Reservoirs
    - San Luis Canal
    - San Luis Drain and Kesterson Reservoir
    - Coalinga Canal

- San Felipe Division
  - Pacheco Tunnel and Conduit
  - Hollister Conduit
  - San Justo Dam and Reservoir
  - Santa Clara Conduit
  - Pacheco Pumping Plant
  - Coyote Pumping Plant

The CVP reservoirs are listed in Table C-1 and shown on Figure C-1 through Figure C-5. Table C-1 also includes East Park and Stony Gorge Reservoirs, which are part of the Bureau of Reclamation Orland Project (not part of CVP) because these reservoirs also affect flows in Stony Creek, a tributary to the Sacramento River.

Table C-1. Major Central Valley Project and Orland Project Reservoirs

Project	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
CVP	Millerton Lake	Friant	San Joaquin River	1942	524,000
CVP	Shasta Lake	Shasta	Sacramento River	1945	4,552,000
CVP	Keswick Reservoir	Keswick	Sacramento River	1950	23,772

Project	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
CVP	Trinity Lake	Trinity	Trinity River	1962	2,447,650
CVP	Lewiston Reservoir	Lewiston	Trinity River	1963	14,660
CVP	Spring Creek Reservoir	Spring Creek Debris Dam	Spring Creek (tributary of Sacramento River)	1963	5,874
CVP	Whiskeytown Lake	Whiskeytown	Clear Creek (tributary of Sacramento River)	1963	241,100
CVP	Folsom Lake	Folsom	American River	1956	967,000
CVP	Lake Natoma	Nimbus	American River	1955	9,000
CVP	Contra Loma Reservoir	Contra Loma	Off-Stream	1967	2,627
CVP	Martinez Reservoir	Martinez	Wildcat Creek	1938	268
CVP	San Luis Reservoir	B.F. Sisk	San Luis Creek	1967	2,041,000
CVP	O'Neill Forebay	O'Neill	San Luis Creek	1967	56,400
CVP	Los Banos Creek Reservoir	Los Banos Detention	Los Banos Creek	1965	34,600
CVP	Little Panoche Creek Reservoir	Little Panoche Detention	Little Panoche Creek	1966	5,580
CVP	San Justo Reservoir	San Justo	Offstream	1985	10,300
CVP	Funks Reservoir	Funks	Funks Creek	1976	2,460
CVP	New Melones Reservoir	New Melones	Stanislaus River	1979	2,400,000
CVP	Hensley Lake	Hidden	Fresno River	1975	90,000
CVP	H.V. Eastman Lake	Buchanan	Chowchilla River	1975	150,000
Orland	East Park Reservoir	East Park	Little Stony Creek (tributary of Sacramento River)	1910	51,000
Orland	Stony Gorge Reservoir	Stony Gorge	Stony Creek (tributary of Sacramento River)	1928	50,350

Sources: California Department of Water Resources 2014a; Bureau of Reclamation 1994, 2014a, 2014b.

C.1.2 Overview of the State Water Project

In 1960, California voters authorized the Burns-Porter Act to construct the initial SWP facilities. The California SWP is a multi-purpose water storage and delivery system that extends more than 705 miles -- two-thirds the length of California. A collection of canals, pipelines, reservoirs, and hydroelectric power facilities delivers water to 27 million Californians, 750,000 acres of farmland, and to businesses throughout California.

Planned, built, operated and maintained by the Department of Water Resources (DWR), the SWP is the nation's largest state-owned water and power generator and user-financed water system. The project is considered an engineering marvel that has helped fuel California's population boom and economic prosperity since its initial construction.

For the last 20 years, the SWP's average water use is 34 percent for agricultural and 66 percent for residential, municipal, and industrial. The State Water Project also plays an important role in efforts to combat climate change. Not only does it help California manage its water supply during extremes such as flooding and drought, it is also a major source of hydroelectric power deliveries for the State's power grid.

DWR manages the California SWP to ensure adequate water supplies are available under various hydrologic and legal conditions while maintaining operational flexibility. DWR also develops, plans and implements the operation of the SWP in coordination with environmental and regulatory agencies to meet fish, water, and environmental requirements for the Feather River and Sacramento-San Joaquin Delta. Additionally, the SWP coordinates closely with other water storage and water users that utilize the Sacramento-San Joaquin Delta watershed.

The SWP is operated in a manner that protects endangered and threatened species under the State and federal endangered species acts. DWR does this in part through compliance with a permit granted by the California Department of Fish and Wildlife (CDFW), called the Incidental Take Permit. DWR also conducts water quality monitoring for the SWP. Initially, this program sought to monitor eutrophication (an increase in chemical nutrients) and salinity in the SWP. Over time, the water quality program expanded to include parameters of concern for drinking water, recreation, and wildlife.

While the majority of the SWP was being constructed in the 1960s, public agencies and local water districts signed long-term water supply contracts with DWR. Today, the 29 public agencies and local water districts are collectively known as the SWP long-term water contractors or simply, SWP water contractors. The water supply contracts (which expire in 2035) sets forth the maximum amount of SWP water a contractor may request annually (see Table A amounts, below). However, the amount of SWP water available for delivery will vary yearly, based on a number of factors, including hydrologic conditions, current reservoir storage levels, and delivery requests from the SWP water contractors.

State Water Project Facilities include:

- Oroville Project
- Delta Division
    - North Bay Aqueduct
    - Barker Slough Pumping Plant
    - Clifton Court
    - Suisun Marsh Salinity Control Gates

Major SWP reservoirs are listed in Table C-2.

Table C-2. State Water Project Reservoirs

Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
Frenchman Lake	Frenchman	Little Last Chance Creek (tributary of Feather River)	1961	55,477
Antelope Lake	Antelope	Indian Creek (tributary of Feather River)	1964	22,566
Lake Davis	Grizzly Valley	Big Grizzly Creek (tributary of Feather River)	1966	83,000
Oroville Reservoir	Oroville	Feather River	1968	3,537,577
Thermalito Pool	Thermalito Diversion	Feather River	1967	13,328
Thermalito Forebay	Thermalito Forebay	Cottonwood Creek (tributary of Feather River)	1967	11,768
Thermalito Afterbay	Thermalito Afterbay	Feather River	1967	57,041
Clifton Court Forebay	Clifton Court Forebay	Old River	1970	29,000
Bethany Forebay	Bethany Forebay	Italian Slough	1961	5,250
Patterson Reservoir	Patterson	Offstream	1962	98
Lake Del Valley	Del Valle	Arroyo Valle	1968	77,100
Quail Lake	No dam	Offstream	Historic	5,654
Pyramid Lake	Pyramid	Piru Creek	1973	180,000
Castaic Lake	Castaic	Castaic Creek	1973	323,700
Silverwood Lake	Cedar Springs	Mojave River (West Fork)	1971	78,000
Crafton Hills Reservoir	Crafton Hills	Yucaipa Creek	2001	130
Lake Perris	Perris	Bernasconi Pass	1973	131,452

Sources: California Department of Water Resources 2014a, 2014b.

C.1.3 Overview of Other Major California Water Projects

During the past 100 years, numerous water supply, flood management, and hydroelectric generation reservoirs were constructed throughout California. Many of these projects were constructed on tributaries to the Sacramento and San Joaquin rivers and tributaries to the Tulare Lake Basin. Operations of these non-CVP and non-SWP reservoirs affect flow patterns into the Sacramento and San Joaquin rivers and the Delta.

Major non-CVP and non-SWP reservoirs in the Sacramento Valley and San Joaquin Valley watersheds, generally with storage capacities greater than 100,000 acre-feet, which could affect operations of CVP or SWP reservoirs or Delta facilities or could be affected by operations of the CVP or SWP, are listed in Table C-3 and

Table C-4. None of these facilities are included in the Proposed Action.

Table C-3. Major Non-Central Valley Project and Non-State Water Project Reservoirs in the Sacramento Valley Watershed Considered

Owner	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
U.S. Army Corps of Engineers	Black Butte Reservoir	Black Butte	Stony Creek (tributary of Sacramento River)	1963	143,700
Yuba County Water Agency	Bullards Bar Reservoir	New Bullards Bar	Yuba River (North Fork)	1970	969,600
U.S. Army Corps of Engineers	Englebright Reservoir	Englebright	Yuba River	1941	70,000
South Sutter Water District	Camp Far West Reservoir	Camp Far West	Bear River	1963	104,500
Pacific Gas & Electric Company	Bucks Lake	Bucks Storage	Bucks Creek (tributary of Feather River)	1928	103,000
Pacific Gas & Electric Company	Lake Almanor	Lake Almanor	Feather River (North Fork)	1927	1,308,000
South Feather Water And Power Agency	Little Grass Valley Reservoir	Little Grass Valley	Feather River (South Fork)	1961	93,010
Pacific Gas & Electric Company	Salt Springs Reservoir	Salt Springs	Mokelumne River (North Fork)	1931	141,900
East Bay Municipal Utility District	Pardee Lake	Pardee	Mokelumne River	1929	209,950
East Bay Municipal Utility District	Camanche Lake	Camanche	Mokelumne River	1963	417,120
Sacramento Municipal Utility District	Union Valley Reservoir	Union Valley	Silver Creek (tributary of American River)	1963	230,000
Placer County Water Agency	French Meadows Reservoir	L. L. Anderson	American River (Middle Fork)	1965	136,400
Placer County Water Agency	Hell Hole Reservoir	Lower Hell Hole	Rubicon River (tributary of American River)	1966	208,400

Sources: California Department of Water Resources 2014a, 2014b.

Table C-4. Major Non-Central Valley Project and Non-State Water Project Reservoirs in the San Joaquin Valley Watersheds Considered

Owner	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
Southern California Edison Company	Lake Thomas A. Edison	Vermilion Valley	Mono Creek (tributary of San Joaquin River)	1954	125,000
Southern California Edison Company	Shaver Lake	Shaver Lake	Stevenson Creek (tributary of San Joaquin River)	1927	135,283
Merced Irrigation District	Lake McClure	New Exchequer	Merced River	1967	1,032,000
San Francisco Public Utilities Commission	Cherry Lake	Cherry Valley	Cherry Creek (tributary of Tuolumne River)	1956	273,500
San Francisco Public Utilities Commission	Hetch Hetchy Reservoir	O' Shaughnessy	Tuolumne River	1923	360,000
Turlock Irrigation District	New Don Pedro Reservoir	New Don Pedro	Tuolumne River	1971	2,030,000
Calaveras County Water District	New Spicer Meadow Reservoir	New Spicer Meadow	Highland Creek (tributary of Stanislaus River)	1989	190,000
Tri-Dam Project	Donnells Reservoir	Donnells	Stanislaus River (Middle Fork)	1958	56,893
Tri-Dam Project	Beardsley Reservoir	Beardsley	Stanislaus River (Middle Fork)	1957	77,600
Tri-Dam Project	Tulloch Reservoir	Tulloch	Stanislaus River	1958	68,400
Oakdale Irrigation District and South San Joaquin Irrigation District	Goodwin Diversion	Goodwin	Stanislaus River	1912	500
South San Joaquin Irrigation District	Woodward Reservoir	Woodward	Simmons Creek (tributary of Stanislaus River)	1918	35,000
U.S. Army Corps of Engineers	New Hogan Lake	New Hogan	Calaveras River	1963	317,000

Sources: California Department of Water Resources 2014a, 2014b.

Major reservoirs used to store CVP and SWP water supplies in the San Francisco Bay Area, Central Coast and Southern California regions are shown on Figure C-4 and Figure C-5 and listed in Table C-5, Table C, and Table C-6.

Table C-5. Major Non-Central Valley Project and Non-State Water Project Reservoirs in the San Francisco Bay Area Region Used to Store Central Valley Project and/or State Water Project Water

Owner	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
Contra Costa Water District	Los Vaqueros Reservoir	Los Vaqueros	Kellogg Creek	1997	160,000
East Bay Municipal Utility District	Briones Reservoir	Briones	Bear Creek	1964	67,520
East Bay Municipal Utility District	San Pablo Reservoir	San Pablo	Bear Creek	1964	38,600
East Bay Municipal Utility District	Lafayette Reservoir	Lafayette	Marsh Creek	1963	4,250
East Bay Municipal Utility District	Upper San Leandro Reservoir	Upper San Leandro	San Leandro Creek	1977	37,960
East Bay Municipal Utility District	Chabot Reservoir	Chabot	San Leandro Creek	1892	10,281

Sources: California Department of Water Resources 2014a, California Department of Water Resources 2014b; East Bay Municipal Utility District 2011; City and County of San Francisco 2009; Santa Clara Valley Water District 2011.
Note: Anderson Reservoir capacity is restricted due to California Department of Safety and Dams (Santa Clara Valley Water District 2011).

Table C-6. Major Non-Central Valley Project and Non-State Water Project Reservoirs in the Central Coast Region Used to Store State Water Project Water

Owner	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
Bureau of Reclamation	Cachuma Lake	Bradbury	Santa Ynez River	1953	205,000

Sources: Bureau of Reclamation 2014c.

Table C-6. Major Non-Central Valley Project and Non-State Water Project Reservoirs in the Southern California Region Used to Store State Water Project Water

Owner	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
United Water Conservation District	Lake Piru	Santa Felicia	Piru Creek	1955	100,000
Metropolitan Water District Of Southern California	Diamond Valley Lake	Diamond Valley Lake	Domenigoni Valley Creek	2000	800,000

Owner	Reservoir	Dam	Stream	Year Initiated	Capacity (acre-feet)
Metropolitan Water District Of Southern California	Lake Skinner	Robert A Skinner	Tucalota Creek	1973	43,800
Rancho California Water District	Vail Lake	Vail	Temecula Creek	1949	51,000
City of Escondido	Dixon Lake	Dixon	Escondido Creek	1970	2,500
San Diego County Water Authority	Olivenhain Reservoir	Olivenhain	Escondido Creek	2003	24,900
City of San Diego	Lake Hodges	Lake Hodges	San Dieguito River	1918	37,700
City of San Diego	San Vincente Reservoir	San Vicente	San Vicente Creek	1943	146,994
City of San Diego	El Capitan Reservoir	El Capitan	San Diego River	1934	112,800
Helix Water District	Lake Jennings	Chet Harritt	Quail Canyon Creek	1962	9,790
Sweetwater Authority	Sweetwater Reservoir	Sweetwater	Sweetwater River	1888	27,700
City of San Diego	Murray Reservoir	Murray	Off-stream	1918	4,818
City of San Diego	Morena Reservoir	Morena	Cottonwood Creek	1912	50,694
City of San Diego	Lower Otay Reservoir	Savage	Otay River	1919	49,849

Sources: California Department of Water Resources 2014a, 2014b; City of San Diego 2019a, 2019b, 2019c, 2019d; San Diego County Water Authority and U.S. Army Corps of Engineers 2008.

Figure C-1. California Major Water Supply Facilities

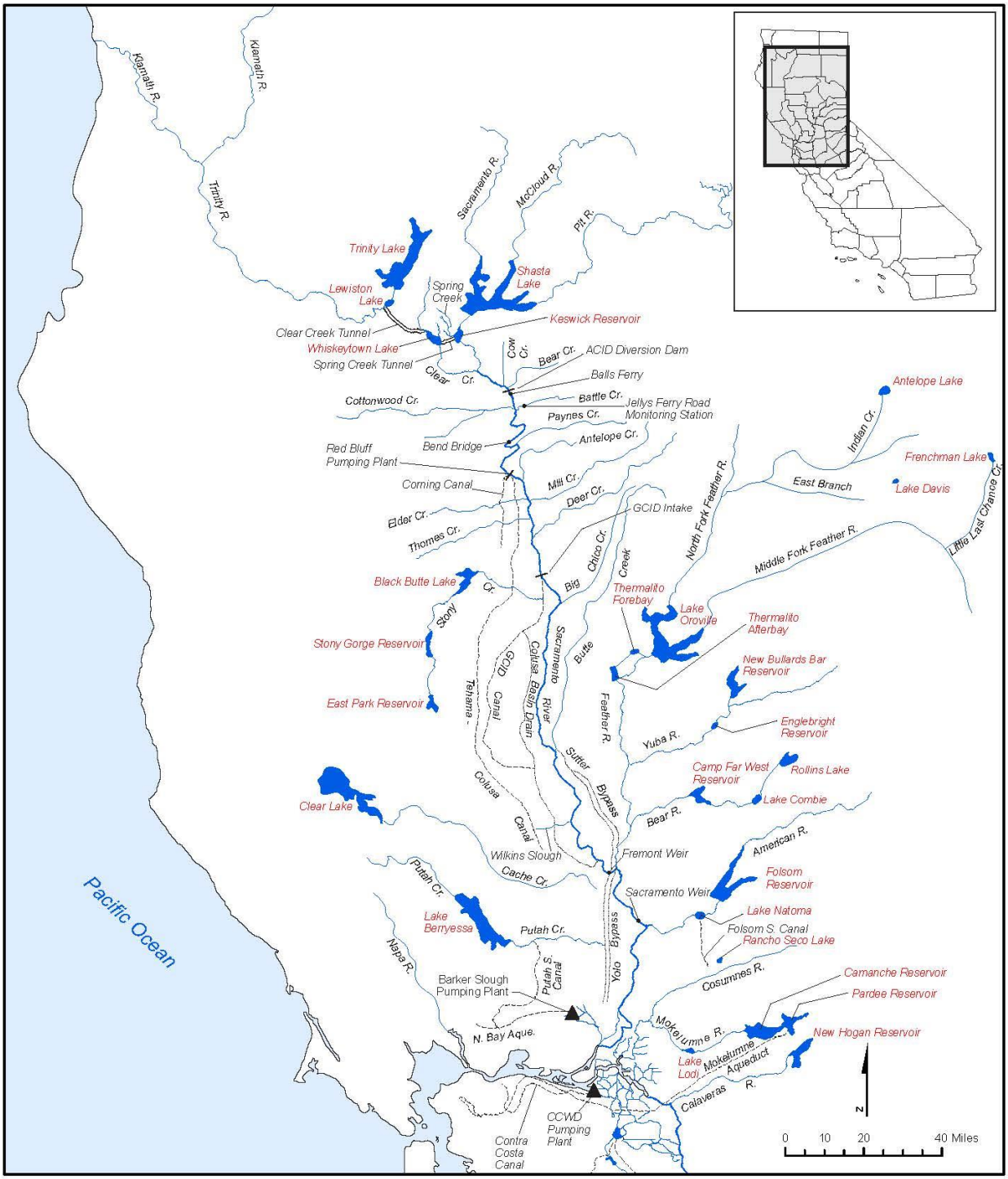

Figure C-2. Northern California Major Water Supply Facilities

This figure is a map of Central California water supply facilities in the San Joaquin Valley and Tulare Lake region. The map shows facilities up to the Cosumnes River in the north and down

south to Cachuma Lake.

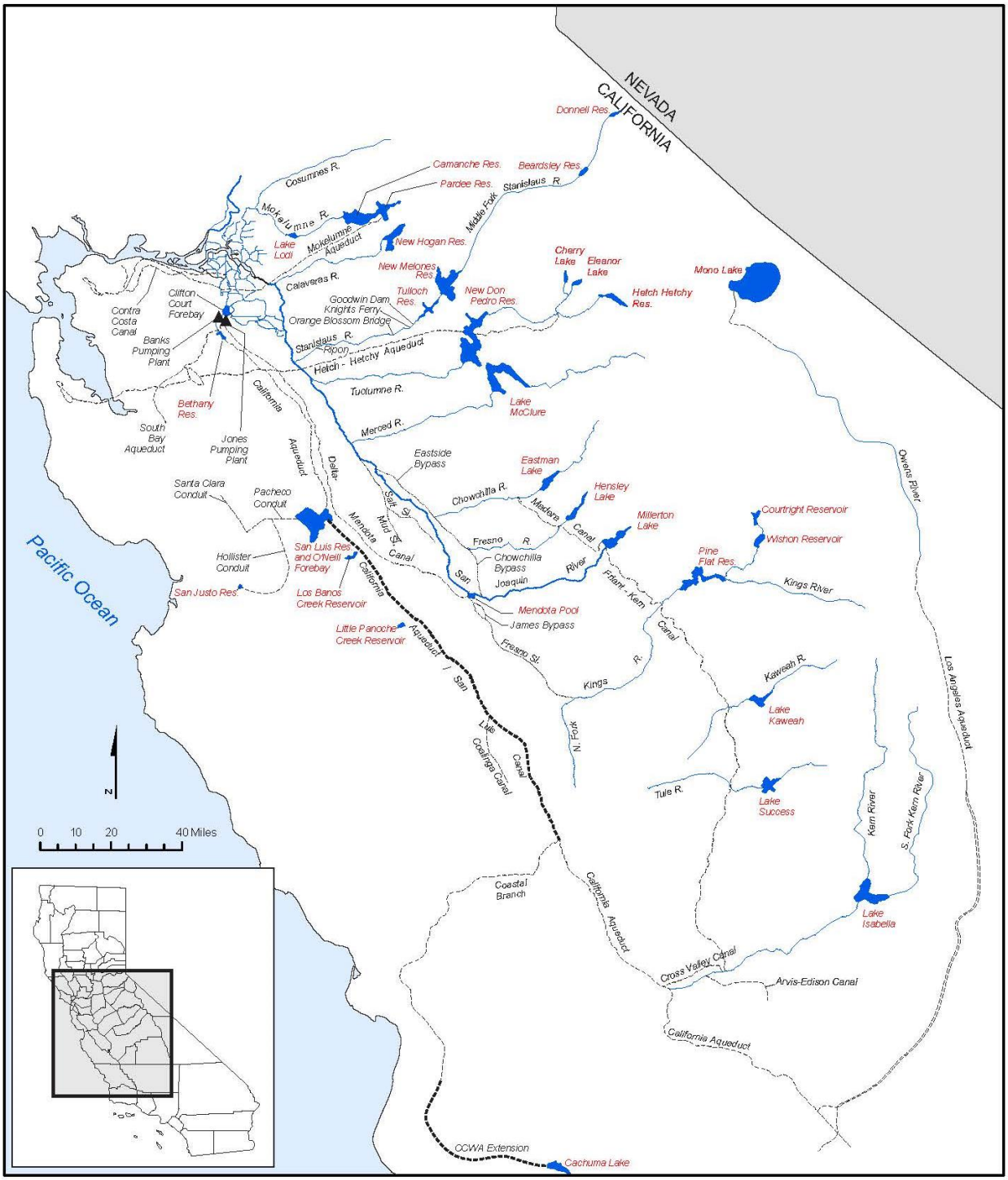

Figure C-3. San Joaquin Valley and Tulare Lake Major Water Supply Facilities

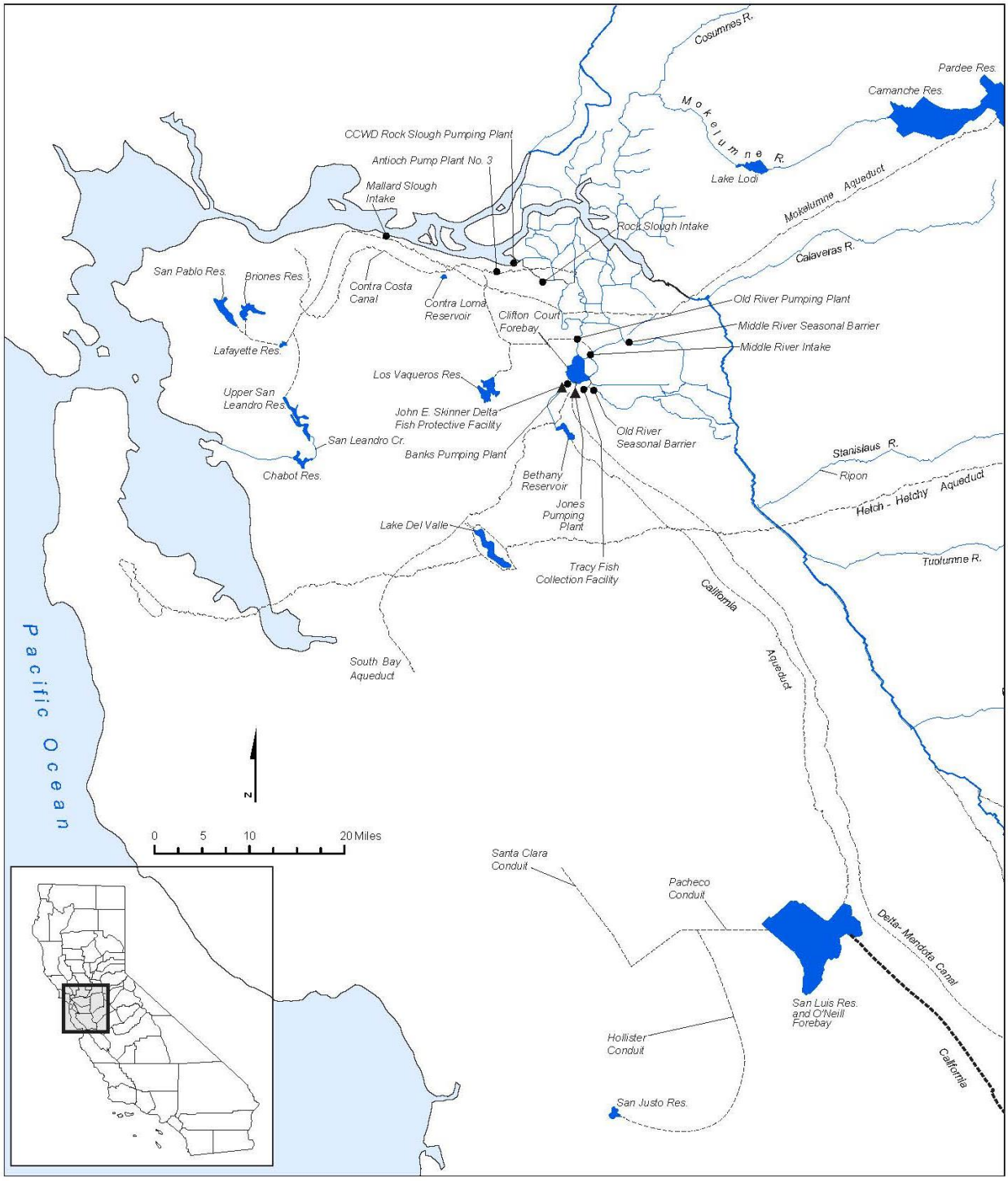

Figure C-4. San Francisco Bay Area Major Water Supply Facilities

Figure C-5. Central Coast and Southern California Major Water Supply Facilities

C.2 Central Valley Project–Trinity Division

The Trinity Division facilities are operated to control floods, store and deliver Trinity River water for irrigation and M&I uses, power generation, and mitigation, protection and restoration of fish and wildlife. The Trinity River Division includes Trinity Dam and Reservoir, Trinity Power Plant, Lewiston Dam and Lake, Trinity River Fish Hatchery, Clear Creek Tunnel, Judge Francis Carr Powerhouse, Whiskey Dam and Lake, Spring Creek Debris Dam and Reservoir, Spring Creek Tunnel, and Spring Creek Power Plant. The Trinity Division includes two smaller units, the Cow Creek Unit and Clear Creek South Unit, but the later was title transferred to the Clear Creek Community Services District 2000 under Public Law 106-566, 114 Stat. 2821.

The Trinity River Division was authorized by the Act of August 12, 1955 to include "a major storage reservoir on the Trinity River with a capacity of two million five hundred thousand acre-

feet, a conveyance system consisting of tunnels, dams, and appurtenant works to transport Trinity River water to the Sacramento River and provide, by means of storage as necessary, such control and conservation of Clear Creek flows as the Secretary determines proper to carry out the purposes of this Act, hydroelectric power plants with a total generating capacity of approximately two hundred thirty-three thousand kilowatts, and such electric transmission facilities as may be required to deliver the output of said powerplants to other facilities of the Central Valley project and to furnish energy in Trinity County."

C.2.1 State Water Resources Control Board Permits and Applications

Water rights permits for the Trinity River Division were originally issued in 1959, 1960 and 1972. Permits 11967, 11968, 11969, 11971 and 11973 to appropriate water of Trinity River for purposes other than power generation were issued on September 16, 1959. Permit 12364 to appropriate water of Clear Creek for purposes other than power generation was issued on July 28, 1960. The Trinity River permits allow storage in Trinity Reservoir and direct diversion at Lewiston Dam, with Lewiston Dam as a point of rediversion of stored water; they further allow the conveyance of the water of Trinity River through a tunnel and powerhouse and release to Whiskeytown Reservoir on Clear Creek. From Whiskeytown Reservoir this water may be rediverted for use in the Bald Hills area or for conveyance through another tunnel and powerhouse and release into Keswick Reservoir on the Sacramento River. The Clear Creek permit allows storage and direct diversion at Whiskeytown Dam through the same works as those used for water released into Whiskeytown Reservoir under the Trinity River permits. The further points of rediversion allowed under all five permits are the intakes of the Tehama-Colusa and Corning Canals, Chico Canal, Delta Cross Channel, Contra Costa Canal and Delta-Mendota Canal. The five permits allow use within a gross area of 4,031,000 acres. The authorized place of use for the Trinity and Whiskeytown water right permits at time of issuance was for the gross place of use shown on Reclamation's Map No. 416-208-341.

A water right permit was issued for Application 5628 (Permit 11967) on September 16, 1959, authorizing direct diversion up to 2,500 cfs year-round, and up to 1,540,000 acre-feet to be diverted for storage year-round. The points of diversion are at Trinity Dam for storage and at Lewiston Dam for direct diversion. Application 5628 was authorized for irrigation, domestic, salinity control purposes.

A water right permit was issued for Application 15374 (Permit 11968) on September 16, 1959, authorizing direct diversion up to 300 cfs year-round, and up to 200,000 acre-feet for storage year- round. The points of diversion are at Trinity Dam and Old River at Jones Pumping Plant. Application 15374 was authorized for municipal and industrial purposes.

A water right permit was issued for Application 15375 (Permit 11969) on September 16, 1959, authorizing direct diversion up to 1,700 cfs year-round, and 1,800,000 acre-feet for storage year-round. The point of diversion is Trinity Dam. The points of diversion are at Trinity Dam and Old River at Jones Pumping Plant. Application 15375 was authorized for irrigation, incidental domestic, fish and wildlife preservation and enhancement, water quality control, and incidental recreation purposes.

A water right permit was issued for Application 16767 (Permit 11971) on September 16, 1959, authorizing 700,000 acre-feet for storage year-round. The points of diversion is at Trinity Dam

and Old River at Jones Pumping Plant. Application 16767 was authorized for irrigation, incidental domestic, and water quality control purposes.

A water right permit was issued for Application 17374 (Permit 11973) on September 16, 1959, authorizing direct diversion up to 1,500 cfs year-round. The points of diversion is at Trinity Dam and Old River at Jones Pumping Plant. Application 17374 was authorized for irrigation, domestic, stock watering, fish and wildlife preservation and enhancement, water quality control, and recreation purposes.

Diversions under Applications 5628, 15374, 15375, 16767, and 17374 shall not exceed 2,500,000 af per year by storage and 3,200 cfs by direct diversion.

A water right permit was issued for Application 17376 (Permit 12364) on July 28, 1960, authorizing direct diversion up to 3,600 cfs from about November 1 to about April 1 of the following year, and up to 250,000 acre-feet by storage from about November 1 to about April 1 of the following year. The points of diversion are at Whiskeytown Dam and Old River at Jones Pumping Plant. Application 17376 was authorized for irrigation, domestic, water quality control, and recreation purposes.

Under State Water Resources Control Board (Water Board) Change Order No. 38, dated December 30, 1960, Applications 15374, 15375, 16767, 17374, and 17376 are authorized for rediversion of previously stored water to off-stream storage at San Luis Reservoir.

A water right permit was issued for Application 5627 (Permit 11966) on September 16, 1959, authorizing direct diversion up to 1,100 cfs year-round and 1,540,000 for storage year-round. The point of diversion is at Trinity Dam. Application 5627 was authorized for power purposes.

A water right permit was issued for Application 15376 (Permit 11970) on September 16, 1959, authorizing direct diversion up to 3,525 cfs year-round and 1,800,000 for storage year-round. The points of diversion is at Trinity Dam and Lewiston Dam. Application 15376 was authorized for power purposes.

A water right permit was issued for Application 16768 (Permit 11972) on September 16, 1959, authorizing direct diversion up to 175 cfs year round, and up to 700,000 acre-feet for storage year-round. The point of diversion is at Trinity Dam. Application 16768 is authorized for power purposes.

The amount of water diverted under the preceding three power permits for diversion at Trinity Dam shall not exceed 2,500,000 acre-feet by storage and 3,700 cfs by direct diversion.

A water right license was issued for Application 15424 (License 9957) on September 21, 1972, authorizing direct diversion up to 1,700 cfs year-round. The point of diversion is at Whiskeytown Dam. License 9957 is authorized for power purposes.

A water right permit was issued for Application 17375 (Permit 12365) on July 28, 1960, authorizing direct diversion up to 1,900 cfs year-round, and up to 250,000 acre-feet for storage from about November 1 to about April 1 of the following year. The point of diversion is at Whiskeytown Dam. Application 17375 was authorized for power purposes.

A water right permit was issued for Application 25846 (License 13482) on May 23, 1983, authorizing the diversion of up to 1,100 acre-feet for storage from October 1 to June 30 the following year. The point of diversion is at Buckhorn Dam. License 13482 is authorized for water quality and fish enhancement purposes of use.

C.2.2 SWRCB D-1641

D-1641 consolidated the purposes of use of Applications 5628, 15374, 15375, 16767, 17374, and 17376 for irrigation, domestic, municipal, industrial, fish and wildlife enhancement, salinity control, water quality control, stock-watering, and recreation purposes, and consolidated the place of use as shown on Reclamation's Map No. 214-208-12581.

C.2.3 Water Supply Contracts

Reclamation administers three repayment contracts within the Trinity Division, which provide for the delivery of up to 40,878 acre-feet of Project Water for irrigation and M&I purposes.

C.2.4 Trinity Dam and Reservoir

Trinity Dam regulates flows on the Trinity River and stores project water within Trinity Reservoir. Completed in 1962, it is an earthfill structure, 538 feet high, with a crest length of 2,450 feet. Trinity Reservoir (Lake) has a storage capacity of 2,448,000 acre-feet. Water is diverted from the lower outlets in Trinity Lake to Lewiston Reservoir to provide cold water to Trinity River. There are no other major dams in the Trinity River watershed. Natural flows began to be stored along the Trinity River in November 1960. Trinity Lake offers recreation facilities for camping, boating, water skiing, swimming, fishing, and hunting.

Water releases occur into the Trinity River as part of flood control operations and to provide other flow releases (California North Coast Regional Water Quality Control Board et al. 2009; Bureau of Reclamation 2011a). Although flood control is not an authorized purpose of the Trinity River Division, flood control benefits are provided through normal operations. The Reclamation Safety of Dams release criteria generally provide for maximum storage in Trinity Lake of 2.1 MAF between November and March. Initial flood releases are discharged from Trinity Lake into Lewiston Reservoir, and then, through the powerplant and into Whiskeytown Lake in the Clear Creek watershed. To reduce the potential for flooding on the Trinity River, releases into Trinity River generally are less than 11,000 cfs from Lewiston Dam (under Safety of Dams criteria) due to local high-water concerns in the floodplain and local bridge flow capacities. Reclamation has periodically released water from Lewiston Dam into the Trinity River to improve late summer flow conditions to avoid fish die-offs in the lower Klamath River or for tribal requirements along the Trinity River (U.S. Department of the Interior 2014; Trinity River Restoration Program 2014).

The Safety of Dams release criteria specify that Carr power plant capacity be used as a first preference destination for Safety of Dams releases made at Trinity Dam. Trinity River releases are made as a second preference destination. During significant Northern California high-water flood events, the Sacramento River water stages are also often at concern levels. Under such high-water conditions, the water that would otherwise move through the Carr power plant is routed to the Trinity River to avoid exacerbating any flooding concerns on the Sacramento River

side. The Safety of Dams criteria provide seasonal storage targets and recommended releases November 1 to March 31.

Water temperature objectives for the Trinity River are contained in State Water Resources Control Board Water Rights Order 90-5. These objectives vary by reach and by season to avoid adverse effects on salmonid spawning and egg incubation in the Trinity River due to factors which are controllable by Reclamation and are a result of modification of Trinity River operations for temperature control on the Sacramento River. Pursuant to the North Coast Water Quality Control Plan (page 4-7.00), between Lewiston Dam and Douglas City Bridge, the daily average temperature should not exceed 60 degrees Fahrenheit (°F) from July 1 to September 14, and shall not exceed 56°F from September 15 to September 30. From October 1 to December 31, the daily average temperature shall not exceed 56°F between Lewiston Dam and the confluence of the North Fork Trinity River. If temperatures exceed 56 degrees as specified, Reclamation shall immediately file with the Water Board a report containing project operational data sufficient to demonstrate that the exceedance was not due to modifications of Trinity River operations for water temperature control on the Sacramento River. If, within fifteen days, the Water Board does not advise Reclamation that it is violating the condition, Reclamation shall be deemed not to have caused the exceedance in order to control temperature on the Sacramento River. This requirement was not construed by the Water Board as interfering with the Interior Secretarial Decision, dated January 14, 1981, relative to Trinity River releases (for increased flows and initiation of a flow evaluation study).

Water temperature objectives from the North Coast Water Quality Control Plan are summarized in the following table.

Table C-9. Water temperature objectives from North Coast Water Quality Control Plan

	Temperature Objective (°F)	
Date	**Douglas City (RM 93.8)**	**North Fork Trinity River (RM 72.4)**
July 1 through September 14	60	–
September 15 through September 30	56	–
October 1 through December 31	–	56

Water storage volumes and water storage elevations for Trinity Lake for Water Years 2001 through 2022 are presented on Figures C-6 and C-7 (California Department of Water Resources 2023a, 2023b). Trinity Lake storage varies in accordance with upstream hydrology and downstream water demands and instream flow requirements. Reclamation maintains at least 600 thousand acre-feet (TAF) in Trinity Reservoir, except during the 10 to 15 percent of the years when Shasta Lake is also drawn down.

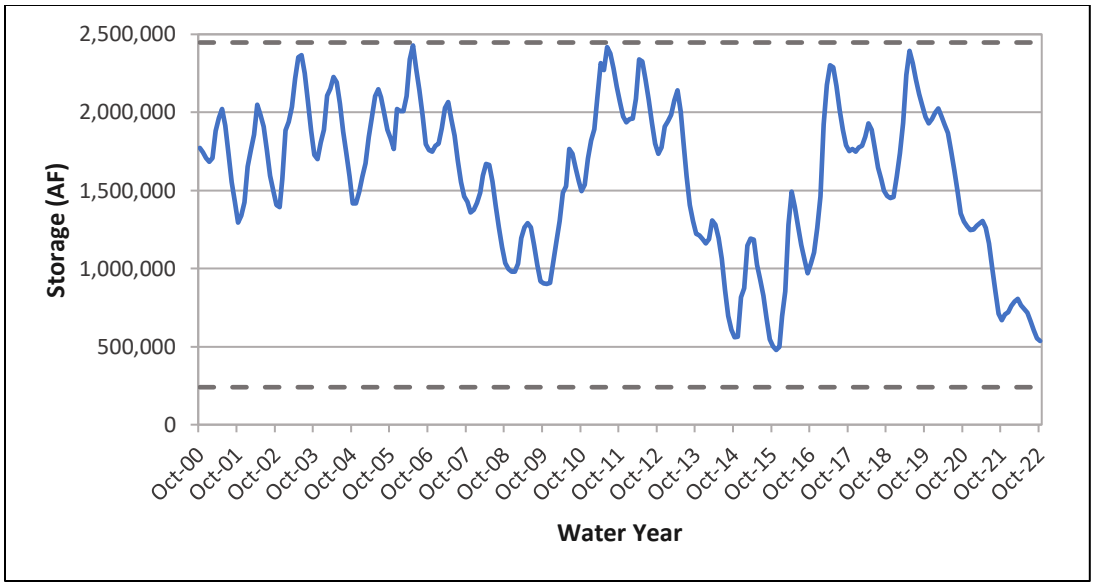

Figure C-6. Trinity Lake Storage

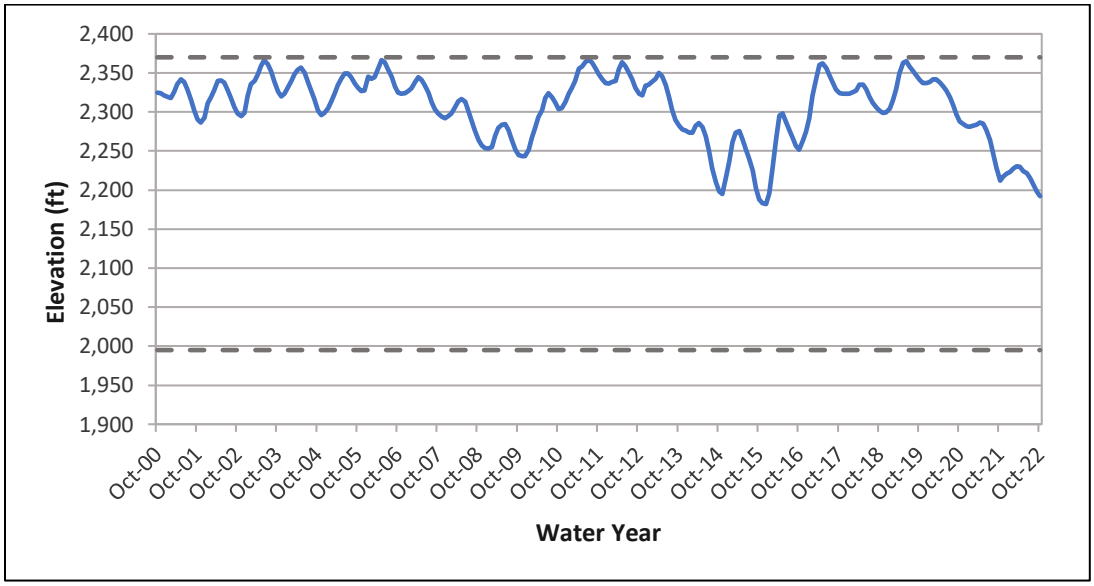

Figure C-7. Trinity Lake Elevation

C.2.4.1 Fish and Wildlife Requirements on Trinity River

The 1955 authorizing legislation for the Trinity River Division included two provisos or exceptions to the full integration of the Trintiy Division operations with the overall CVP. The first proviso directed the Secretary to adopt appropriate measures to insure the preservation and propagation of fish and wildlife, including, certain minimum flows in the Trinity River for the months July through November and in Clear Creek. The second proviso required not less than 50,000 acre-feet to be released annually from the Trinity Reservoir and made available to

Humboldt County and downstream water users. Both of these requirements were included as conditions in the water rights permits issued for the Trinity River Division.

In December 2000, the Secretary of the Interior adopted the Trinity River Mainstem Fishery Restoration Record of Decision (Trinity River ROD), as required by CVPIA section 3406(b)(23) which required the development of permanent instream fishery flows and supporting Trinity River Division operating criteria and procedures for the restoration and maintenance of the Trinity River fishery. The Trinity River ROD included physical channel rehabilitation; sediment management; watershed restoration; and variable annual instream flow releases from Lewiston Dam based on forecasted hydrology for the Trinity River Basin as of April 1st each year that range from 368,600 acre-feet/year in critically dry years to 815,000 acre-feet/year in extremely wet years.

Stored water in Trinity Reservoir is used in support of The Long-Term Plan to Protect Adult Salmon on the Lower Klamath River ROD, dated April 20, 2017. This Plan requires supplemental flows from Lewiston Dam to prevent a disease outbreak (*Ichthyophthirius multifiliis*) in the lower Klamath River in years when the flow in the lower Klamath River is projected to be less than 2,800 cfs. The ROD identifies three flow augmentation components:

1. a preventive base-flow release that targets increasing the base flow of the lower Klamath River to 2,800 cfs from mid-August to late September to improve environmental conditions;
2. a one-day preventive pulse flow (targeting 5,000 cfs in the lower Klamath River) to be used as a secondary measure to alleviate continued poor environmental conditions and signs of *Ichthyophthirius multifiliis* infection in the lower Klamath River; and
3. a five-day emergency pulse flow (targeting 5,000 cfs in the lower Klamath River) to be used on an emergency basis as a tertiary treatment, to avoid a significant die-off of adult salmon when the first two components are not successful at meeting intended objectives.

The first proviso requiring minimum fishery flows support the resulting flow decisions in the 2000 ROD and the 2017 Long Term Plan. The flows for the second proviso have never been released independent of flows released under the first proviso.

C.2.4.2 Trans-basin Diversions

Diversion of Trinity water to the Sacramento Basin provides water supply and major hydroelectric power generation for the CVP. Maximum storage levels in Trinity Reservoir generally occur in April or May. A key consideration in the export timing determination is the thermal degradation that occurs in Whiskeytown Lake due to the long residence time of trans-basin exports in the lake. To minimize the thermal degradation effects, trans-basin export patterns are typically scheduled to provide an approximate 120 TAF volume to occur in late spring to create a thermal connection to the Spring Creek Powerhouse before larger trans-basin volumes are scheduled to occur during the hot summer months. Typically, the water flowing from the Trinity Basin through Whiskeytown Lake must be sustained at fairly high rates to avoid warming and to function most efficiently for temperature control. The time period for which effective temperature control releases can be made from Whiskeytown Lake may be compressed when the total volume of Trinity water available for export is limited. Export volumes from Trinity are made in coordination with the operation of Shasta Lake. Other considerations

affecting the timing and magnitude of Trinity exports are power generation demand, and the maintenance schedule of the diversion works and generation facilities.

C.2.5 Trinity Powerplant

Trinity Powerplant is a peaking plant with generated power dedicated to meeting the needs of the CVP facilities. Any remaining energy is then marketed to various preference customers in northern California, with Trinity County having first preference. Trinity Dam's hydroelectric powerplant began operation in 1964 with a capacity of 100,000 kW for its two generators. In the mid-1980s Reclamation uprated both generators by 20,000 kW by using advancements in high voltage technology bringing the current total capacity to 140,000 kW.

C.2.6 Trinity River Fish Hatchery

The Trinity River Fish Hatchery, operated by the California Department of Fish and Wildlife, has a capacity of about 15 million eggs. It is immediately downstream from Lewiston Dam and compensates for the upstream spawning area that has been rendered inaccessible and unusable by the dams.

C.2.7 Lewiston Dam and Reservoir

Lewiston Reservoir, a CVP facility on the Trinity River formed by Lewiston Dam, was constructed by 1963 and is located 7 miles downstream of the Trinity Dam. Lewiston Dam is an earthfill structure, 91 feet high and 754 feet long, forming a reservoir with a capacity of 14,660 acre-feet. Lewiston Dam creates an afterbay to Trinity Powerplant. The top of active conservation pool is at elevation 1902.00 feet and the top of inactive conservation pool is at elevation 1898.00 feet. Lewiston Reservoir is used as a regulating reservoir for downstream releases to the Trinity River and to Whiskeytown Lake, located in the adjacent Clear Creek watershed. Releases from Lewiston Dam are also used to provide attraction flows for the Lewiston Hatchery intake and water for the hatchery infrastructure. There is a temperature curtain in Lewiston Reservoir that provides for lower temperature water releases into the Trinity River.

Historical water storage volumes and water storage elevations in Lewiston Reservoir for Water Years 2001 through 2022 are presented on Figures C-8 and C-9 (California Department of Water Resources 2023c, 2023d). The Lewiston Reservoir water storage volume is more consistent throughout the year because this reservoir is used to regulate flow releases to the powerplant and other downstream uses; and not to provide long-term water storage.

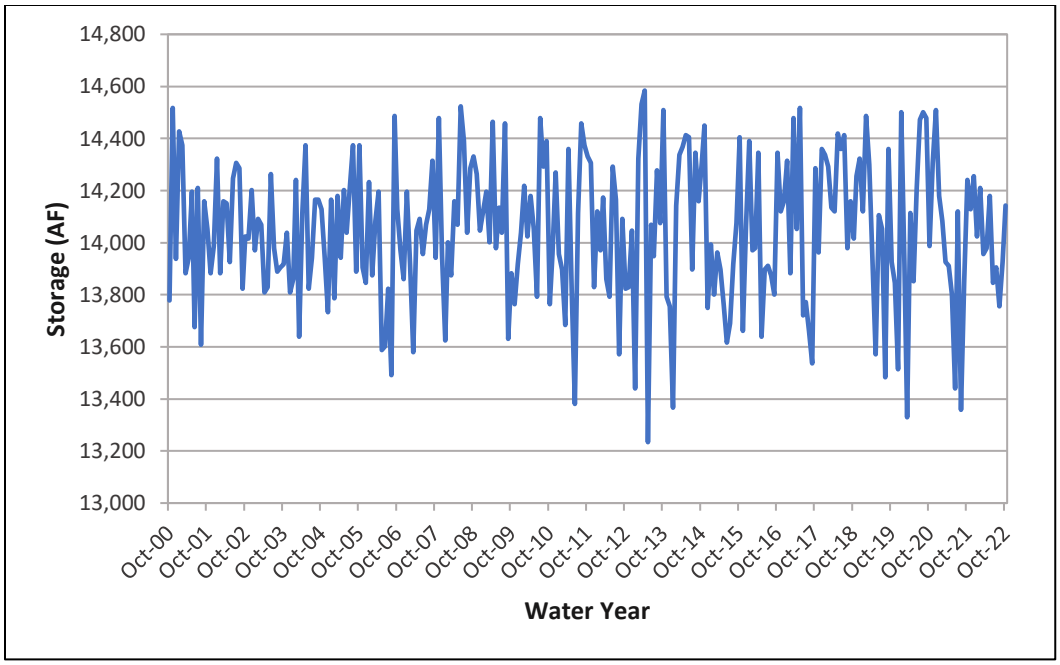

Figure C-8. Lewiston Reservoir Storage

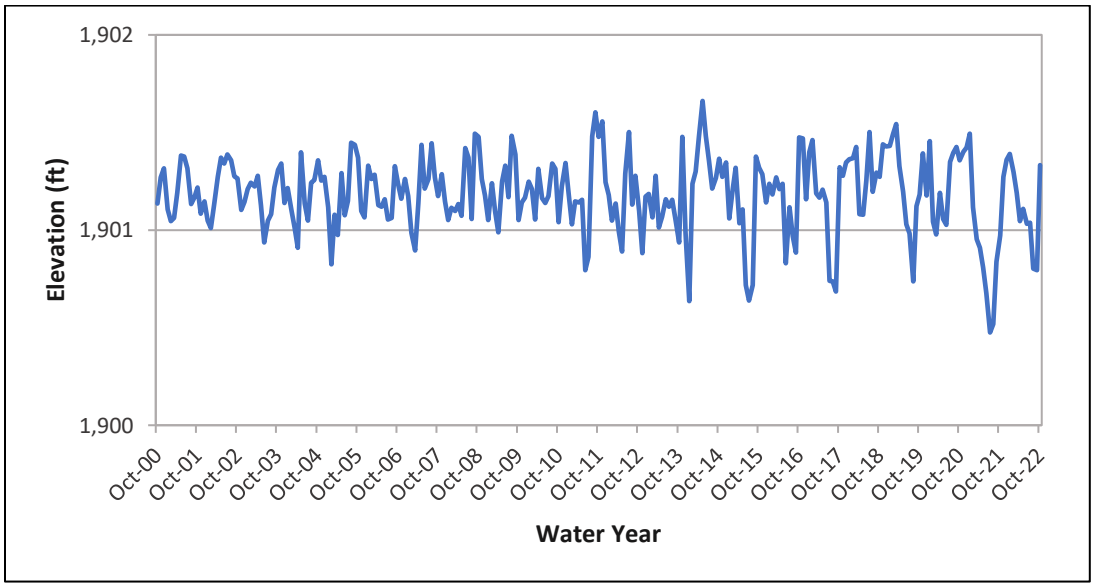

Figure C-9. Lewiston Reservoir Elevation

C.2.8 Clear Creek Tunnel

Clear Creek Tunnel, 17.5 feet (5.33 meters [m]) in diameter and 10.7 miles (17.22 km) long, conveys water from Lewiston Lake to Judge Francis Carr Powerhouse into Whiskeytown Lake. A bypass is provided through Crystal Creek.

C.2.9 Judge Francis Carr Powerhouse

The Judge Francis Carr Powerhouse (formerly Clear Creek Powerplant) is on Clear Creek at the outlet of the Clear Creek Tunnel on the northwestern extremity of Whiskeytown Lake. It is at the downstream end of the Clear Creek Tunnel, which transports water from Lewiston Reservoir to Whiskeytown Reservoir.

The power facilities consist of an intake structure located in Lewiston Reservoir, a 10.7-mile (17.38 km) long, 17.5 feet (5.34 m) diameter tunnel, a powerplant bypass to Clear Creek, a surge tank and basin, two penstocks and valve structure house, and two 13.8 kilovolt (kV) generators each rated at 80,000 kilovolt-amps (kVA), 0.965 power factor, with Francis turbines.

The Judge Francis Carr Powerhouse began operation in 1963. Its generators' capacity was 143,680 kW. The units were uprated in 1984 to their current capacity of 154,400 kW. It is a peaking plant whose power is first dedicated to meeting the energy requirements of the CVP facilities. The remaining energy is marketed to various preference customers in northern California.

C.2.10 Whiskeytown Lake and Dam

Whiskeytown Dam and Lake were authorized by Section 1 of the 1955 Trinity River Division Act. The facilities are part of "a conveyance system consisting of tunnels, dams, and appurtenant works to transport Trinity River water to the Sacramento River and provide, by means of storage as necessary, such control and conservation of Clear Creek flows as the Secretary determines proper to carry out the purposes of this Act." The Dam was built in 1963 and is the only dam on Clear Creek and is located approximately 16.5 miles downstream of the headwaters (Bureau of Reclamation 1997). Whiskeytown Dam is an earthfill dam with a structural height of 282 feet, a crest elevation at 1228.0 feet, and a crest length of 4,000 feet. The outlet works capacity is 1,240 cfs at elevation 1220.5 feet and the spillway capacity is 28,650 cfs at elevation 1220.5 feet. The top of active conservation pool is at elevation 1210.0 feet and the top of dead storage pool is at 972.0 feet.

Whiskeytown Lake has a storage capacity of 0.241 MAF or 241 TAF. Whiskeytown Lake encompasses a drainage area of 202.5 square miles and has a surface area of 3,220 acres.

Flows from Lewiston Reservoir in the Trinity River watershed are diverted to Whiskeytown Lake through the Clear Creek Tunnel. Currently, the Clear Creek Tunnel between Lewiston Reservoir and Whiskeytown Lake has a capacity of 3,200 cfs (Bureau of Reclamation 2011b). Whiskeytown Dam regulates runoff from Clear Creek and diversions from the Trinity River watershed, Most of the water released from Whiskeytown Dam flows through the Spring Creek Tunnel to Keswick Reservoir.

Whiskeytown Dam also releases water to Clear Creek, which flows to the Sacramento River below Keswick Dam. The capacity of the outlet from Whiskeytown Dam that conveys water to Clear Creek is 1,240 cfs when the water elevation in Whiskeytown Lake is at 1,220.5 feet. To provide flows into Clear Creek in excess of 1,240 cfs, the Whiskeytown Reservoir water elevations need to be raised higher than 1,220.5 feet to allow water to flow through the Glory Hole spillway.

Whiskeytown is normally operated to (1) regulate inflows for power generation and recreation; (2) support upper Sacramento River temperature objectives; and (3) provide for releases to Clear Creek. However, Whiskeytown Lake storage is relatively constant due to agreements between Reclamation and the National Park Service to maintain certain summer and winter lake elevations for recreation. From May through October storage is held fairly constantly at that level in most years. In the winter through spring (November through April), Whiskeytown Lake storage is annually drawn down by approximately 35 TAF to assist in regulating excessive winter storm runoff. Heavy rainfall events occasionally result in glory hole discharges to Clear Creek. Operations at Whiskeytown Lake during flood conditions are complicated by its operational relationship with the Trinity River, Sacramento River, and Clear Creek. On occasion, imports of Trinity River water to Whiskeytown Reservoir may be suspended to avoid aggravating high flow conditions in the Sacramento Basin.

During the summer and early-fall Trinity River releases are used for multiple purposes. Water is released to the mainstem Trinity River to meet temperature objectives; water is diverted through the Judge Francis Carr powerplant to Whiskeytown Reservoir to assist in maintaining Whiskeytown storage elevation, provide cool water for releases to Clear Creek for temperature control objectives, and to decrease residence time of Lewiston Lake flows for Trinity River temperature control. Water is also diverted from Whiskeytown through Spring Creek tunnel to the Sacramento River below Keswick Reservoir to assist with maintaining temperature objectives in the Sacramento River.

Water storage volume and water storage elevations related to Whiskeytown Lake for Water Years 2001 through 2022 are presented on Figures C-10 and C-11(California Department of Water Resources 2023e, 2023f). Whiskeytown Lake storage is relatively constant due to agreements between Reclamation and the National Park Service to maintain certain winter and summer lake elevations for recreation. Whiskeytown Lake outflow variations were greater prior to 2006 when Trinity River restoration flows were implemented which reduced the amount of water available for conveyance to CVP water users. In addition, hydrologic conditions in the years following 2006 were drier than the water years between 2001 and 2006.

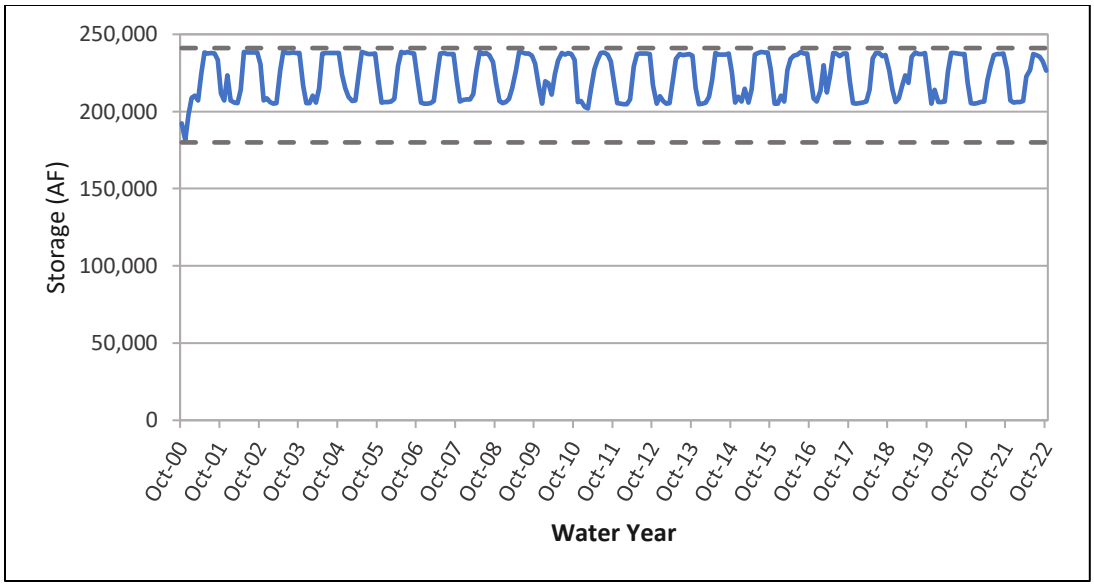

Figure C-10. Whiskeytown Lake Storage

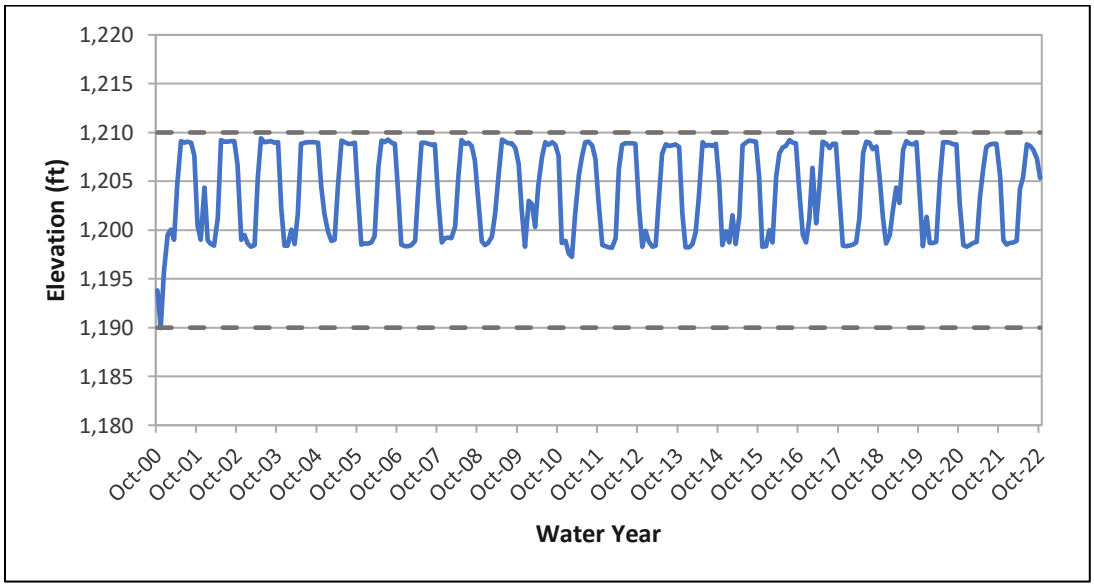

Figure C-11. Whiskeytown Lake Elevation

In the summer and fall, Whiskeytown Lake is a major recreational destination with recreational facilities, administered by the U.S. National Park Service, and Reclamation operates to provide as full as practical lake elevations.

Reclamation's water rights permits issued by the Water Board for diversions from Trinity River and Clear Creek specify minimum downstream releases from Lewiston and Whiskeytown Dams, respectively. Additional operational guidance is found in the following documents, summarized below in Table C.10, govern releases from Whiskeytown Lake:

- A 1960 Memorandum of Agreement with CDFW established minimum flows to be released to Clear Creek at Whiskeytown Dam.
- A 1963 release schedule for Whiskeytown Dam was developed with USFWS and implemented, but never finalized. Although this release schedule was never formalized, Reclamation has used this flow schedule for minimum flows since May 1963.
- Water rights permit modification in 2002 that required the by-pass or release of water over, under, around or through Whiskeytown Dam into Clear Creek for the purposes of maintenance of fish and wildlife resources as provided for in Provision 2.1 of Instream Flow Preservation Agreement by and among Reclamation, USFWS, and CDFW, dated August 11, 2000.

Table C-10. Minimum Flows at Whiskeytown Dam

Period	Minimum flow (cfs)
1960 MOA with CDFW	
January 1–February 28(29)	50
March 1–May 31	30
June 1–September 30	0
October 1–October 15	10
October 16–October 31	30
November 1–December 31	100
1963 USFWS Proposed Normal year flow	
January 1–October 31	50
November 1–December 31	100
1963 USFWS Proposed Critical year flow	
January 1–October 31	30
November 1–December 31	70
2002 Water Right Modification for Critical year flow	
January 1–October 31	50
November 1–December 31	70

C.2.10.1 Temperature Control Curtain

Two fully functional water temperature curtains exist in Whiskeytown Reservoir. These curtains have been subject to repairs since their initial installation in 1993. The purpose of these curtains is to improve passage of cold source water through the reservoir during the warm months of the year for downstream cold-water needs (i.e., threatened and endangered fish). The Oak Bottom Temperature Control Curtain is located in the upstream portion of the reservoir, and the Spring Creek curtain is located in front of the Spring Creek tunnel at the eastern end of Whiskeytown Reservoir.

C.2.11 Spring Creek Tunnel

The Spring Creek Tunnel diverts water from Whiskeytown Lake on Clear Creek, a tributary of the Sacramento River, to the Spring Creek Powerplant. The tunnel is 18.5 feet (5.64 m) in diameter and about 2.4 miles (3.86 km) long including the 0.6- mile (0.96 km) long, 17-foot (5.18 m) diameter Rock Creek Siphon.

C.2.12 Spring Creek Powerplant

Spring Creek Powerplant is near Redding, California, at the Spring Creek arm of Keswick Reservoir, about one mile (1.6 km) northwest of Keswick Dam. It is near the base of the Spring Creek Debris Dam, and water for power is received through the Spring Creek Tunnel which diverts the water from Whiskeytown Lake. Water from the plant is discharged to Keswick Reservoir.

The powerplant houses two 13.8kV generators each rated at 100,000 kVA, 90 power factor, along with Francis turbines. The Spring Creek power conduit varies in diameter between 5.64 m (18.5 feet) and 5.18 m (17 feet) and is about 4.8 km (3 miles) in length. The power conduit consists of Tunnels No. 1 and No. 2, and Rock Creek Siphon. Twin penstocks take off from Tunnel No. 2 leading to the powerplant.

The Spring Creek Powerplant has operated since 1964. The initial capacity was 150,000 kW; the current capacity is 180,000 kW. Spring Creek Powerplant operations are tied to flow regimes aimed at minimizing the building of metal concentrations in the Spring Creek arm of the Keswick Reservoir. The Spring Creek Powerplant is a peaking plant whose power is dedicated first to meeting the requirements of the CVP facilities. Excess power is marketed to various preference customers in northern California.

C.2.13 Spring Creek Debris Dam

The Spring Creek Debris Dam (SCDD) was authorized by the 1955 Trinity River Division Act and was constructed to regulate runoff containing debris and acid mine drainage from Spring Creek, a tributary to the Sacramento River that enters Keswick Reservoir. The SCDD can store approximately 5.8 TAF of water.

In January 1980, Reclamation, CDFW, and Water Board executed a Memorandum of Understanding (MOU) to implement actions that protect the Sacramento River system from heavy metal pollution from Spring Creek and adjacent watersheds. The MOU states that Reclamation agrees to operate to dilute releases from SCDD (according to the criteria and schedules provided), provided that such operation would not cause flood control parameters on the Sacramento River to be exceeded and would not unreasonably interfere with other Project requirements as determined by Reclamation. The MOU also specifies a minimum schedule for monitoring copper and zinc concentrations at SCDD and in the Sacramento River below Keswick Dam. Reclamation has primary responsibility for the monitoring; however, CDFW and Regional Water Quality Control Board (RWQCB) also collect and analyze samples on an as-needed basis. Due to more extensive monitoring, improved sampling and analysis techniques, and continuing cleanup efforts in the Spring Creek drainage basin, Reclamation now operates SCDD to target the more stringent Central Valley RWQCB Basin Plan criteria in addition to the

MOU goals. Instead of the total copper and total zinc criteria contained in the MOU, Reclamation operates SCDD releases and Keswick dilution flows to not exceed the CVRWQCB Basin Plan standards of 0.0056 mg/L dissolved copper and 0.016 mg/L dissolved zinc. Release rates are estimated from a mass balance calculation of the copper and zinc in the debris dam release and in the river.

In order to minimize the build-up of metal concentrations in the Spring Creek arm of Keswick Reservoir, releases from the debris dam are coordinated with releases from the Spring Creek Power Plant to keep the Spring Creek arm of Keswick Reservoir in circulation with the main water body of Keswick Lake.

The operation of SCDD is complicated during major heavy rainfall events. SCDD reservoir can fill to uncontrolled spill elevations in a relatively short time period, anywhere from days to weeks. Uncontrolled spills at SCDD can occur during major flood events on the upper Sacramento River and also during localized rainfall events in the Spring Creek watershed. During flood control events, Keswick releases may be reduced to meet flood control objectives at Bend Bridge when storage and inflow at Spring Creek Reservoir are high.

Because SCDD releases are maintained as a dilution ratio of Keswick releases to maintain the required dilution of copper and zinc, uncontrolled spills can and have occurred from SCDD. In this operational situation, high metal concentration loads during heavy rainfall are usually limited to areas immediately downstream of Keswick Dam because of the high runoff entering the Sacramento River, adding dilution flow. In the operational situation when Keswick releases are increased for flood control purposes, SCDD releases are also increased to reduce spill potential.

In the operational situation when heavy rainfall events would fill SCDD and Shasta Lake would not reach flood control conditions, increased releases from CVP storage may be required to maintain desired dilution ratios for metal concentrations. Reclamation has voluntarily released additional water from CVP storage to maintain release ratios for toxic metals below Keswick Dam. Reclamation has typically attempted to meet the CVRWQCB Basin Plan standards, but these releases have no established criteria and are dealt with on a case-by-case basis. Since water released for dilution of toxic spills is likely to be in excess of other CVP requirements, such releases increase the risk of a loss of water for other beneficial purposes.

C.2.14 Buckhorn Dam and Reservoir

Following completion of the Trinity River Division, annual runs of salmon and Steelhead trout returning to the Trinity River Fish Hatchery declined about 90%. In the 1970s, Grass Valley Creek, a Tributary of Trinity River, was recognized as a main source of sand buildup in Trinity Reservoir. The Trinity River Task Force was reactivated in 1974 to investigate methods of controlling sediment in Grass Valley Creek. The task force determined that a dam and reservoir on the creek would best control the sediment. Buckhorn Dam was consequently authorized by Congress in 1980 through the Trinity River Stream Rectification Act (Pub. L. No. 96-335) which aimed to control sand deposition problems resulting from the degraded Grass Valley Creek watershed. Construction of Buckhorn Dam was completed in 1991.

C.2.15 Cow Creek Unit

The Cow Creek Unit consists of the Wintu Pumping Plant and the Cow Creek Aqueduct. The facilities transport water from the Sacramento River to areas east of Redding, California for irrigation purposes. The facilities are used to irrigate approximately 6.800 acres of land.

C.3 Central Valley Project–Shasta Division

The Shasta Division facilities are authorized to be operated for navigation, flood control, regulating the flow of the Sacramento River, storage and the delivery of water for irrigation and M&I uses, power generation, and mitigation, protection and restoration of fish and wildlife.

The CVP's Shasta Division was first authorized by the Rivers and Harbors Act of 1935, and was reauthorized by the Rivers and Harbors Act of 1937. Under the 1937 Act, the authorized purposes of the Shasta Division were, "first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power." In 1992, Congress enacted CVPIA, which amended the authorized purposes of the CVP, including the Shasta Division, as follows: "first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and fish and wildlife mitigation, protection and restoration purposes and, third, for power and fish and wildlife enhancement"

Shasta Division facilities are located on the Sacramento River in Northern California near Redding, California. The Shasta Division includes Shasta Dam, Lake and Power Plant, and Keswick Dam, Reservoir and Power Plant. Shasta Dam stores and releases water for authorized purposes, while Keswick Dam reregulates releases from Shasta Dam into the Sacramento River, which flows southerly to the Sacramento-San Joaquin Delta.

The Shasta Division is operated in coordination with the Trinity Division of the CVP, including Whiskeytown Dam and the Spring Creek Tunnel, which transports CVP water from the Trinity River Basin to Keswick Reservoir. Water that is released from Shasta and Keswick Dams flows down the Sacramento River where it is diverted at various points along the river for authorized purposes. Some of the water that reaches the Sacramento-San Joaquin Delta may be exported South of the Delta for authorized purposes in accordance with applicable regulatory and contractual provisions.

C.3.1 State Water Resources Control Board D -990

In 1961, the Water Board issued D-990, granting permits to Reclamation for the appropriation of water from the Sacramento River and Delta for CVP purposes. In doing so, the Water Board ordered 29 conditions in D-990.

In Condition 10, the Water Board authorized the appropriation of up to 6,500,000 acre-feet of water by direct diversion and storage each year under permits issued pursuant to Applications 5626, 9363, 9364, 9366, 9367 and 9368. None in excess of 3,450,000 acre-feet of this amount shall be by direct diversion. The maximum combined rate of direct diversion and rediversion of stored water shall not exceed 22,000 cfs. In Condition 11, the Water Board authorized the appropriation by storage of up to 4,493,000 acre-feet annually of Sacramento River water for

power and other beneficial uses pursuant to Applications 5625, 5626, 9363, 9364 and 9365. These appropriations allow Reclamation to store and divert Sacramento River water for water supply and other purposes for use within the Sacramento Division and South of the Delta.

However, in Condition 23 to D-990, the Water Board made the "export of stored water . . . outside the watershed of Sacramento River Basin or beyond the Sacramento-San Joaquin Delta . . . subject to the reasonable beneficial use of said stored water within said watershed and Delta," as long as agreements with in-basin users were entered into by March 1, 1964. The executed agreements are commonly known as the SRS Contracts. Additionally, in Condition 24, the Water Board directed Reclamation to bypass or release into the Sacramento River at Keswick Dam fish life flows, as provided in a 1960 Memorandum of Agreement (MOA) with the California Department of Fish and Game, which is now known as CDFW.

C.3.2 State Water Resources Control Board Applications and Permits

Following issuance of D-990, the Water Board issued several water right permits to Reclamation.

A water right permit was issued for Application 5626 (Permit 12721) on April 12, 1961, authorizing direct diversion up to 8,000 cfs from about September 1 to about June 30 of the following year, and up to 3,190,000 acre-feet to be diverted for storage from about October 1 to about June 30 of the following year. The points of diversion are at Shasta Dam and Old River at Jones Pumping Plant. Application 5626 was authorized for irrigation, incidental domestic, recreation, and stock-watering purposes. The authorized place of use was for the gross place of use as shown on Reclamation's Map No. 602-212-78.

A water right permit was issued for Application 9363 (Permit 12722) on April 12, 1961, authorizing direct diversion of up to 1,000 cfs from about September 1 to about June 30 of the following year, and up to 310,000 acre-feet to be diverted for storage from about October 1 to about June 30 of the following year. The points of diversion are at Shasta Dam and Old River at Jones Pumping Plant. Direct diversion is also authorized year-round for points of diversion downstream of Shasta Dam along the Sacramento River to the Delta. Application 9363 was authorized for municipal and industrial purposes. The authorized place of use was for the gross place of use as shown on Reclamation's Map No. 602-212-166.

A water right permit was issued for Application 9364 (Permit 12723) on April 12, 1961, authorizing direct diversion up to 9,000 cfs from about September 1 to about June 30 of the following year, and up to 1,303,000 acre-feet to be diverted for storage from about October 1 to about June 30 of the following year. The points of diversion are at Shasta Dam, Old River at Jones Pumping Plant, and at points within the Delta. Application 9364 was authorized for irrigation, incidental domestic, stock-watering, and recreation. The authorized place of use was for the gross place of use as shown on Reclamation's Map No. 602-212-78.

The above three water right applications are also authorized for direct diversion at Keswick Dam, Tehama-Colusa Canal pumping plant, Delta Cross Channel, Jones Pumping Plant (Old River Intake and Delta-Mendota Canal), and the Contra Costa Canal (Rock Slough Intake). Rediversion of water previously stored in Shasta Reservoir is also authorized at those facilities. Their authorized places of use are for a gross area of 3,450,000 acres delineated on

Reclamation's maps. These applications do not authorize any rediversion of previously stored water to off-stream storage at San Luis Reservoir.

A water right permit was issued for Application 5625 (Permit 12720) on April 12, 1961, authorizing direct diversion up to 11,000 cfs year-round, and up to 3,190,000 acre-feet to be diverted for storage from about October 1 to about June 30 of the following year. The point of diversion is at Shasta Dam. Application 5625 was authorized for power.

A water right permit was issued for Application 9365 (Permit 12724) on April 12, 1961, authorizing direct diversion up to 2,275 cfs year-round, and up to 1,303,000 acre-feet from about October 1 to about June 30 of the following year. The point of diversion is at Shasta Dam. Application 9365 was authorized for power.

A water right license was issued for Application 10588 (License 9956) on September 21, 1972, authorizing direct diversion up to 13,800 cfs year-round. The point of diversion is at Keswick Dam. Application 10588 is authorized for power and incidental domestic purposes.

C.3.3 State Water Resources Control Board Water Rights Order 90-5

In 1990, the Water Board issued Water Rights Order 90-5, which amended the water right permits and licenses for Shasta and Keswick Dams and the Spring Creek Power Plant in two important ways. First, Order 90-5 modified the minimum flow requirements initially established in the 1960 MOA for the Sacramento River below Keswick Dam and required by Condition 24 of D-990. More specifically, Order 90-5 set the minimum flow below Keswick Dam from September through February to be 3,250 cfs in all but critically dry years. Table C-11 below depicts the minimum flow requirements and objectives for the Sacramento River below Keswick Dam under the 1960 MOA (through Condition 24 of D-990) and Order 90-5 (through the second condition pertaining only to permits for diversions at Shasta and Keswick Dams).

Table C-11. Minimum Flow Requirements and Objectives (cfs) on the Sacramento River below Keswick Dam

Period	MOA	Water Rights 90-5	MOA and Water Rights 90-5
Water Year Type	Normal	Normal	Critically Dry
January 1–February 28(29)	2,600	3,250	2,000
March 1–March 31	2,300	2,300	2,300
April 1–April 30	2,300	2,300	2,300
May 1–August 31	2,300	2,300	2,300
September 1–September 30	3,900	3,250	2,800
October 1–November 30	3,900	3,250	2,800
December 1–December 31	2,600	3,250	2,000

cfs = cubic feet per second

Second, Order 90-5 required Reclamation to meet specified water quality (temperature) objectives for the "protection of the fishery in the upper Sacramento River." The Order requires

Reclamation to operate Shasta Dam, Keswick Dam, and the Spring Creek Power Plant to meet a daily average water temperature of 56 degrees F in the Sacramento River at Red Bluff Diversion Dam during periods when higher temperatures will be detrimental to the fishery. If there are factors "beyond the reasonable control of [Reclamation]" that prevent meeting 56 degrees F at Red Bluff Diversion Dam, then Reclamation, in consultation with fishery agencies and the Western Area Power Administration, may select an alternative temperature compliance point location upstream of the Red Bluff Diversion Dam where Reclamation will meet a daily average water temperature of 56 degrees F. Reclamation must immediately report any such change in location to the Water Board and must also "file an operation plan showing [its] strategy to meet the temperature requirement at the new location." Unless the Water Board objects to the change within 10 days after submission, Reclamation may meet the temperature requirement at the new location until it is within Reclamation's reasonable control to meet it at Red Bluff Diversion Dam.

In 1991, the Water Board issued Order 91-1, which amended Order 90-5, but did not modify the provisions of 90-5 regulating minimum flows for fish or the temperature requirements for the Sacramento River.

C.3.4 Flood Control

Reclamation operates Shasta and Keswick Dams for flood control purposes in accordance with regulating criteria developed by the USACE in 1977. Flood control objectives for Shasta Lake require that releases be restricted to quantities that would not cause downstream flows or stages to exceed specified levels. These include a flow of 79,000 cfs at the tailwater of Keswick Dam, and a stage of 39.2 feet in the Sacramento River at Bend Bridge gauging station, which corresponds to a flow of approximately 100,000 cfs.

Maximum flood space reservation is 1,300,000 acre-feet, with variable storage space requirements based on an inflow parameter. Beginning March through May and continuing to October, there are no flood control restrictions (top of conservation storage is at gross pool). During the remaining months, reservoir storage space for flood control varies as a function of date and hydrologic conditions with up to 1,300,000 acre-feet reserved for flood management (top of conservation storage furthest below gross pool). Flood control operation at Shasta Lake requires forecasting runoff conditions into Shasta Lake and runoff conditions of unregulated creek systems downstream from Keswick Dam as far in advance as possible. A critical element of upper Sacramento River flood operations is the local runoff entering the Sacramento River between Keswick Dam and Bend Bridge.

The unregulated creeks (major creek systems are Cottonwood Creek, Cow Creek, and Battle Creek) in this reach of the Sacramento River can be very sensitive to a large rainfall event and produce high rates of runoff into the Sacramento River in short time periods. During large rainfall and flooding events, the local runoff between Keswick Dam and Bend Bridge can exceed 100,000 cfs.

The travel time required for release changes at Keswick Dam to affect Bend Bridge flows is approximately 8 to 10 hours. If the total flow at Bend Bridge is projected to exceed 100,000 cfs, the release from Keswick Dam is decreased to maintain Bend Bridge flow below 100,000 cfs. As the flow at Bend Bridge is projected to recede, the Keswick Dam release is increased to evacuate

water stored in the flood control space at Shasta Lake. Changes to Keswick Dam releases are scheduled to minimize rapid fluctuations in the flow at Bend Bridge.

The flood control criteria for Keswick releases specify that releases should not be increased more than 15,000 cfs or decreased more than 4,000 cfs in any 2-hour period. The restriction on the rate of decrease is intended to prevent sloughing of saturated downstream channel embankments caused by rapid reductions in river stage. In rare instances, the rate of decrease may have to be accelerated to avoid exceeding critical flood stages downstream.

C.3.5 State Water Resources Control Board D-1641

In D-1641, the Water Board amended specified water right licenses and permits for the CVP and SWP to require the Projects to meet certain objectives in the Bay-Delta Plan. Reclamation operates Shasta and Keswick Dams in coordination with other CVP and SWP facilities to meet those objectives, including Delta water quality and flow objectives to improve fisheries conditions, which includes releases for salinity objectives. D-1641 consolidated the purposes of use of water right Applications 5626, 9363, and 9364 for irrigation, domestic, municipal, industrial, fish and wildlife enhancement, salinity control, water quality control, stock-watering, and recreation purposes, and consolidated the place of use as shown on Reclamation's Map No. 214-208-12581.

C.3.6 Navigation Flows at Wilkins Slough

Historically, the Sacramento River was used for navigation, and Reclamation operated Shasta to provide a minimum navigation flow of approximately 5,000 cfs at the Wilkins Slough gauging station on the Sacramento River (near Chico Landing). However, there is no longer any commercial traffic above the City of Sacramento on the Sacramento River, and the USACE has not dredged that reach of the river to preserve channel depths since 1972. Thus, flows for navigation purposes are no longer needed in the Sacramento River. Nonetheless, long-time water users diverting from the river depend on flows at Wilkins Slough, so that the water level in the river does not fall below their pump intakes. Consequently, any need for flows of 5,000 cfs at Wilkins Slough on the Sacramento River is driven by water supply demands, not navigation.

The 5,000 cfs minimum flow is not an express requirement of any CVP authorization, including the 1935 Rivers and Harbors Act, the 1937 Rivers and Harbors, and CVPIA. Section 1 of the 1935 Rivers and Harbors Act, the original authorization for the CVP, states that "the following works of improvement of rivers ... are hereby adopted and authorized . . . in accordance with the plans recommended in the respective reports hereinafter designated and subject to the conditions set forth in such documents . . . Sacramento River, California; Rivers and Harbors Committee Document Numbered 35, Seventy-third Congress." That 1934 report, which was prepared by the USACE, recommended federal appropriations for the project "if the flow of the river is increased to the minimum flow of 5,000 cfs." (CVP Documents, Part 1, 544, 548 [Comm. Doc. 35, 73rd Cong.]) In the 1937 Rivers and Harbors Act, Congress directed that "improvement of navigation" and "irrigation" are authorized purposes of the project, but there is no mention of a minimum flow of 5,000 cfs. The 1937 Act also transferred responsibility for constructing and operating the CVP from the Secretary of War to the Secretary of the Interior. In 1946, the Secretary of the Interior approved an Allocation of Costs and Feasibility Report for the CVP, stating that the project, "as authorized and at present partially constructed, will provide . . . : (a)

Navigation--A minimum flow of 5,000 [cfs] . . . at all points below Chico Landing, except for certain months in extremely dry years." (CVP Documents, Part 1, 580, 585 [H. Doc. 45, 90th Cong.]). Thus, the 1946 report recognizes that the 5,000 cfs flow was intended to benefit "navigation," which no longer exists on the Sacramento River, and that the 5,000 cfs flow could not be met in all years.

C.3.7 Water Supply Contracts

The Shasta Division provides water to meet numerous contractual demands below Shasta Dam, including those of contractors within the Sacramento Division of the CVP and contractors located south of the Delta. For the purpose of contract administration, Reclamation considers only five contracts to be within the Shasta Division, which provide for the annual delivery of up to 15,812 acre-feet of Project Water for M&I purposes to communities located near Shasta Dam and Lake. Those five contracts, initially water service contracts, were converted to repayment contracts under the WIIN Act.

C.3.8 Shasta Dam, Lake, and Powerplant

Shasta Dam, completed in 1945, is a 602-foot-high concrete gravity dam, which provides flood control, power, and water supply benefits. Shasta Dam is located at approximately Sacramento River Mile 308 near Redding, California. Shasta Dam forms Shasta Lake, which is fed primarily by the Sacramento, McCloud, and Pit Rivers. The dam regulates the flow from a drainage area of approximately 6,649 square miles. Shasta Lake has a maximum storage capacity of 4.552 MAF, and the water stored in Shasta represents about 41 percent of the stored water in the CVP. Water in Shasta Lake is released through or around the Shasta Power Plant to the Sacramento River, where it is re-regulated downstream by Keswick Dam. A small amount of water is diverted directly from Shasta Lake for M&I uses by local communities. Water released from Shasta Dam travels approximately 245 miles over three to four days to the northern Delta boundary near Freeport (Bureau of Reclamation 2013).

Historical water storage volumes and water storage elevations for Shasta Reservoir for Water Years 2001 through 2022 are presented on Figures C-12 and C-13 (California Department of Water Resources 2023g, 2023h). Shasta Reservoir storage varies in accordance with upstream hydrology and downstream water demands and instream flow requirements. For example, storage declined during the drier years in 2008 and 2009.

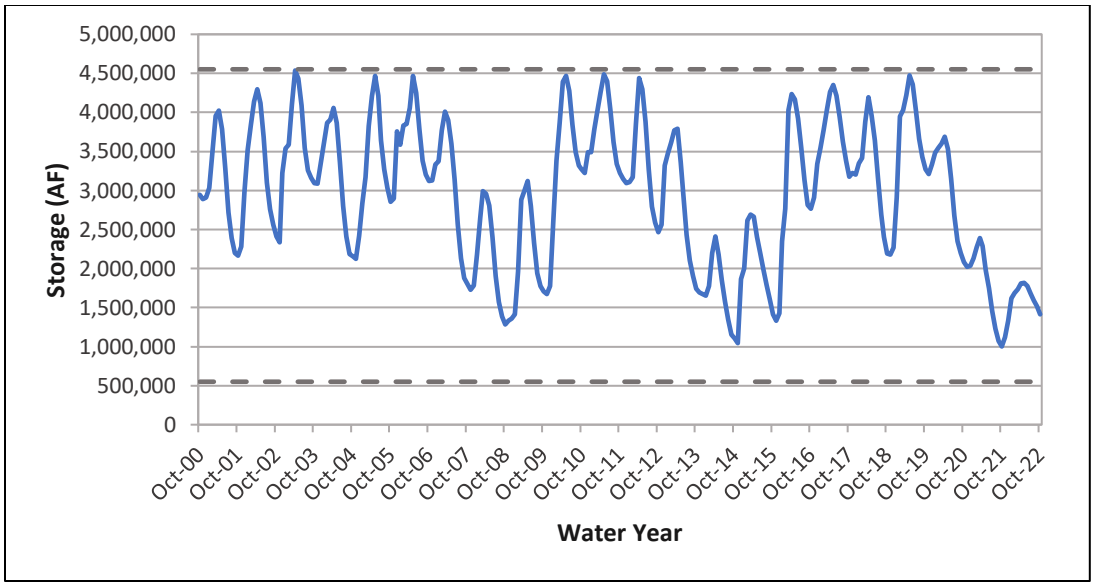

Figure C-12. Shasta Storage

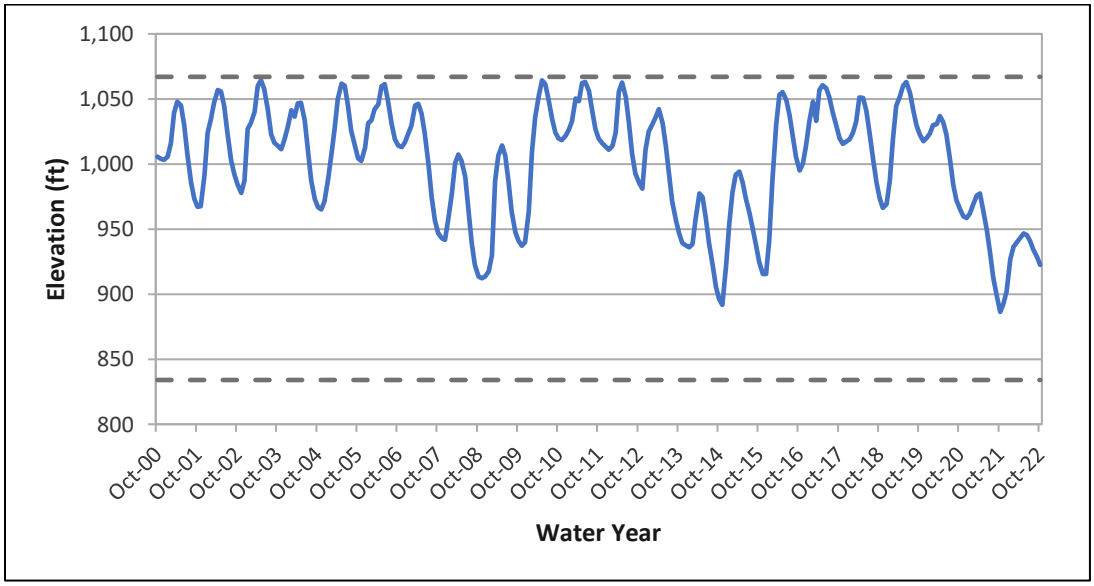

Figure C-13. Shasta Elevation

The Shasta Powerplant is located just below Shasta Dam. Water from the dam is released through five 15-foot penstocks leading to the five main generating units and two station service units. Water released to meet downstream commitments will pass through the generators causing them to spin, generating clean, inexpensive hydroelectric power for distribution to the western power grid. The Shasta Powerplant is a peaking plant with an installed capacity of 663,000 kilo-watts. Its power is dedicated first to meeting the requirements of the project facilities. The remaining power is marketed to various preference customers in northern California.

C.3.9 Shasta Temperature Control Device

Section 3406(b)(6) of CVPIA authorized and directed the Secretary to construct and operate a Temperature Control Device (TCD) at Shasta Dam in order "to control water temperatures in the upper Sacramento River in order to protect anadromous fish." Prior to construction of the Shasta TCD, Reclamation released water from Shasta Dam's low-level river outlets to alleviate high water temperatures during critical periods of the spawning and incubation life stages of the winter-run Chinook Salmon stock. The release of water through the low-level river outlets was a major facet of Reclamation's efforts to control upper Sacramento River temperatures from 1987 through 1996. Releases through the low-level outlets bypass the power plant and result in a loss of hydroelectric generation at the Shasta Power Plant.

Construction of the TCD at Shasta Dam was completed in 1997. This device is designed for greater flexibility in managing the cold-water reserves in Shasta Lake, enabling hydroelectric power generation to occur while managing salmon habitat conditions in the upper Sacramento River. The TCD enables selective release of water from varying lake levels through the power plant in order to manage and maintain adequate water temperatures in the Sacramento River downstream of Keswick Dam.

Reclamation's operation of the TCD varies by season. During mid-winter and early-spring, the highest possible elevation gates are utilized to draw from the upper portions of the lake to conserve deeper colder resources. During late-spring and summer, the operators begin the seasonal progression of opening deeper gates as Shasta Lake elevation decreases and cold-water resources are utilized. In late-summer and fall, the TCD side gates are opened to utilize the remaining cold-water resource below the Shasta Power Plant elevation in Shasta Lake. Table C-12, Shasta Temperature Control Device Gates with Elevation and Storage, shows TCD gates with associated elevations and storages.

Table C-12. Shasta Temperature Control Device Gates with Elevation and Storage

TCD Gates	Shasta Elevation with 35 feet of Submergence (feet)	Shasta Storage (MAF)
Upper Gates	1,035	~3.65
Middle Gates	935	~2.50
Pressure Relief Gates	840	~0.67
Side Gates	720*	~0.01

*Low level intake bottom

TCD = Temperature Control Device; MAF = million acre-feet

The seasonal progression of the Shasta TCD operation is designed to maximize the conservation of coldwater resources deep in Shasta Lake, until the time the resource is of greatest management value for fishery management purposes. Recent operational experience with the Shasta TCD has demonstrated significant operational flexibility improvement for cold water conservation and upper Sacramento River water temperature and fishery habitat management purposes. Recent operational experience has also demonstrated the Shasta TCD has significant leaks that are inherent to TCD design. Also, operational uncertainties cumulatively impair the seasonal

performance of the Shasta TCD to a greater degree than was anticipated in previous analysis and modeling used to describe long-term Shasta TCD benefits.

C.3.10 Keswick Dam, Reservoir and Powerplant

Keswick Dam is a 157-foot-high concrete gravity dam, with a crest length of 1,046 feet, constructed nine miles downstream from Shasta Dam on the Sacramento River. Keswick Dam was completed in 1950 and forms Keswick Reservoir. It has a capacity of approximately 238,000 acre-feet and serves as an afterbay for releases from Shasta Dam and for discharges from the Spring Creek Power Plant (through the Spring Creek Tunnel). The Keswick Reservoir water storage volume is more consistent throughout the year because this reservoir is used to regulate flow releases to the powerplant and other downstream uses and not to provide long-term water storage. With steady releases from Keswick Dam, Reclamation can reregulate the flows of the Sacramento River downstream of the dam. Keswick Power Plant, located at Keswick Dam, has three generators with a total installed capacity of 117 kilowatts. The dam also has a fish trapping facility that operates in conjunction with the Coleman National Fish Hatchery on Battle Creek.

The Keswick Reservoir water storage volume is more consistent throughout the year because this reservoir is used to regulate flow releases to the powerplant and other downstream uses and not to provide long-term water storage, as shown on Figures C-14 and C-15 (California Department of Water Resources 2023i, 2023j).. With steady releases from Keswick Dam, Reclamation can reregulate the flows of the Sacramento River downstream of the dam. Keswick Power Plant, located at Keswick Dam, has three generators with a total installed capacity of 117 kilowatts. The dam also has a fish trapping facility that operates in conjunction with the Coleman National Fish Hatchery on Battle Creek.

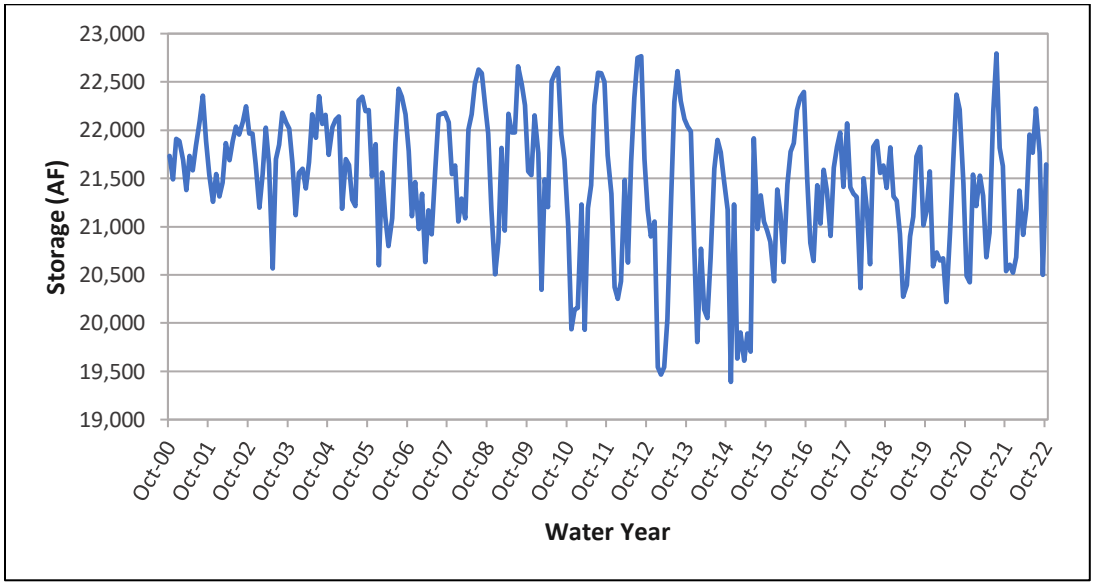

Figure C-14 Keswick Reservoir Storage

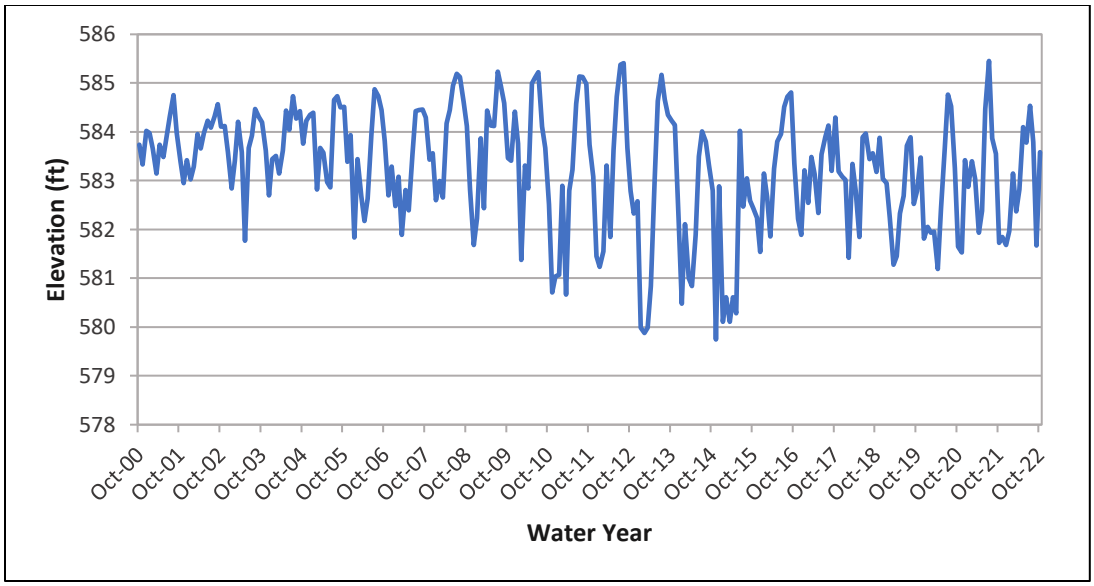

Figure C-15. Keswick Reservoir Elevation

C.4 Central Valley Project–Sacramento River Division

The Sacramento River Division includes two units: the Black Butte Unit and the Sacramento Canals Unit, which operate independently of one another. The Black Butte Unit includes Black Butte Dam, which the USACE owns and operates for flood control, recreation, and conservation storage. Black Butte Dam regulates Stony Creek flood flows, which enter the Sacramento River downstream of Hamilton City. Black Butte Dam is operated in coordination with the East Park and Stony Gorge Dams (part of the Orland Project) through an exchange agreement with Reclamation. East Park and Stony Gorge Dams are operated by the Orland Unit Water Users' Association through an operations and maintenance agreement with Reclamation.

Facilities within the Sacramento River Canals Unit are used to divert water from the Sacramento River for CVP purposes. Major facilities in the Sacramento Canals Unit include the Red Bluff Pumping Plant, the Tehama-Colusa Canal and the Corning Canal. Those facilities are located along the Sacramento River downstream of Keswick Dam and are used to divert water from the Sacramento River to CVP contractors for irrigation and M&I purposes.

The Sacramento Canals Unit is operated in conjunction with facilities in the Trinity and Shasta Divisions of the CVP. Generally, Reclamation releases water from Shasta Dam, which flows into Keswick Reservoir before being released at Keswick Dam into the Sacramento River. Reclamation also releases water from Whiskeytown Lake, part of the Trinity Division, via two routes: (1) the Spring Creek tunnel, which transports water to Keswick Reservoir and (2) Clear Creek, which flows into the Sacramento River below Keswick Dam. Below Keswick Dam, the Sacramento River flows southerly towards the Delta past Sacramento Canals Unit facilities.

Along the Sacramento River below Shasta Dam, there are numerous water users that divert water through Sacramento Division facilities and non-Federal facilities. The latter includes two major

diversions owned by Sacramento River Settlement (SRS) Contractors: the Anderson-Cottonwood Irrigation District diversion dam and the Glenn-Colusa Irrigation District pumping plant. Other SRS Contractors also divert water directly from the Sacramento River through private facilities.

C.4.1 Water Supply Contracts

Within this Division, Reclamation administers several types of water contracts: water service and repayment contracts, settlement contracts, exchange contracts, refuge contracts, and Warren Act contracts. Most of the water that Reclamation makes available for diversion under those contracts is used for irrigation purposes. A much smaller amount is used for M&I and refuge purposes.

Water Service and Repayment Contracts: Within the Sacramento Division, Reclamation annually delivers up to 428,012 acre-feet of Project Water for irrigation and M&I purposes. Generally, Reclamation is shielded from liability if there is a shortage of Project Water due to a drought or an action taken by Reclamation to comply with a legal obligation. For the purpose of contract administration, Reclamation breaks down the water service and repayment contracts in the Sacramento Division into four Units.

- *Black Butte Unit:* Within this Unit, Reclamation administers six contracts that provide for the delivery of up to 3,500 acre-feet annually of water for irrigation and M&I purposes.
- *Colusa Basin Unit:* The Colusa Basin Drain is an earthen drainage channel beginning northeast of Willows, California near the Sacramento River, and extending southerly for about 70 miles and flowing into the Sacramento River. Reclamation administers one contract that provides for the delivery of up to 70,000 acre-feet annually of replacement water from the Sacramento River for irrigation purposes.
- *Corning Canal Unit:* The Corning Canal, discussed below, conveys Project Water that is diverted from the Sacramento River at the Red Bluff Pumping Plant. Within this unit, Reclamation administers three contracts that provide for the delivery of up to 32,900 acre-feet annually of Project Water for primarily irrigation purposes. Of that amount, only 8 acre-feet annually has been historically used for M&I purposes.
- *Tehama-Colusa Canal Unit:* The Tehama-Colusa Canal, also discussed below, conveys Project Water that is diverted from the Sacramento River at the Red Bluff Pumping Plant. Within this unit, Reclamation administers eighteen contracts that provide up to 305,800 acre-feet annually of Project Water for primarily irrigation purposes. Of that amount, 275 acre-feet annually has been historically used for M&I purposes.

SRS Contracts: SRS Contractors divert water directly from the Sacramento River through private facilities at various locations below Shasta Dam. Reclamation administers 134 SRS Contracts that provide for the diversion of approximately 2.115 million acre-feet of water annually.[4] The Contract Total, which includes both Project Water and Base Supply, is

[4] This includes a repayment contract executed with the City of West Sacramento. That contract provides for the annual delivery of up to 9,680 af of Project Water for M&I purposes plus additional water under its own water rights. The combined total is up to 23,600 af of water each year.

automatically reduced by 25 percent when there is a Critical Year. Base Supply is made available for diversion from April through October for no charge, while Project Water is made available during the summer months (June to September) for payment of rates and charges. Most of the SRS Contracts provide water for irrigation purposes, but a few provide water for M&I purposes.

Exchange Contracts: Reclamation administers two exchange contracts, which provide for the delivery of up to 6,000 acre-feet annually of Substitute Water. The contractors exchanged their right to divert water from Clear Creek under pre-1914 water rights water for the ability to divert Substitute Water provided by Reclamation. These contracts do not include a Shasta Critical Year shortage provision or any other liability provisions that would shield Reclamation from liability if there is a Condition of Shortage.

Refuge Contracts: Reclamation administers two agreements that provide for the delivery of up to 151,250 acre-feet annually of water to meet the Level 2 refuge water supply demands of North of Delta wildlife refuges. Pursuant to Section 3406(d)(4) of CVPIA, Reclamation may temporarily reduce deliveries under these contracts "up to 25 percent of such total whenever reductions due to hydrologic circumstances are imposed upon agricultural deliveries of Central Valley Project water." For a more complete discussion of the CVPIA Refuge Water Supply Program, please see Section 11.

Warren Act Contracts: Reclamation administers several Warren Act contracts in the Sacramento Division that provide for the conveyance of non-Project Water through Excess Capacity in Reclamation facilities, such as the Tehama-Colusa Canal.

C.4.2 Red Bluff Pumping Plant

The Red Bluff Pumping Plant is located near the city of Red Bluff, California at river mile 243 above the Sacramento-San Joaquin Delta. The facility includes a 1,118-foot-long flat-plate fish screen, intake channel, a 2,500 cfs capacity pumping plant and a discharge conduit to divert water from the Sacramento River into the Tehama-Colusa and Corning Canals.

The Red Bluff Pumping Plant was authorized in 1992 by Section 3406(b)(10) of CVPIA to continue diversions of Sacramento River to the Tehama-Colusa and Corning Canals while minimizing fish passage problems associated with the old Red Bluff Diversion Dam. The old diversion dam was authorized by the Sacramento Valley Canals Act of 1950, was completed in 1964, and was used to divert water to the same two canals. The dam, however, created fish passage issues for anadromous fish moving through the Sacramento River. With completion of the Red Bluff Pumping Plant in 2012, the dam gates at the diversion dam were permanently raised to allow for improved fish passage.

C.4.3 Tehama-Colusa Canal

The Tehama-Colusa Canal was authorized by the Sacramento Valley Canals Act of 1950 "to permit the most effective irrigation of irrigable lands lying in the vicinity of said canal and supply water for industrial, domestic, and other beneficial uses for these lands in Tehama, Glenn and Colusa Counties." It is a lined canal extending 111 miles south from the settling basin at the Red Bluff Pumping Plant and provides CVP water to the west side of the Sacramento Valley in Tehama, Glenn, Colusa, and northern Yolo counties. Construction of the Tehama-Colusa Canal

began in 1965, and was completed in 1980. The canal has a capacity of 2,100 cubic feet per second. Funks Dam and Reservoir is located between canal reaches 5 and 6, has an active capacity of 1,190 acre-feet, and is used to store and regulate canal flows. The Tehama-Colusa Canal Authority (TCCA) operates the canal.

C.4.4 Corning Canal

The Corning Canal was authorized by the Sacramento Valley Canals Act of 1950 to convey water for irrigation and M&I purposes to lands in Tehama and Butte Counties. The Canal was completed in 1959 to provide water to the CVP contractors that could not be served by gravity from the Tehama-Colusa Canal. The Corning Pumping Plant lifts water approximately 56 feet from the screened portion of the settling basin into the unlined, 21-mile-long Corning Canal. The TCCA operates the Corning Canal.

C.4.5 Black Butte Unit

The Black Butte Unit includes Black Butte Dam and Lake. Black Butte Dam was completed in 1963 and forms Black Butte Lake. The dam is located on Stony Creek, west of the city of Orland, California, and is operated by the USACE. When full, the lake has a surface area of 4,460 acres, is seven miles long, and has a shoreline of 40 miles. The dam mainly provides flood control, but does supply some surplus water to the Sacramento Canals Unit of the CVP and through exchange to the Orland Project for irrigation, as well as to the Contra Costa Water District and surrounding areas. By the Act of October 23, 1970, Congress directed that Black Butte Dam and Lake be financially and operationally integrated with the CVP. However, responsibility for operation and maintenance of the dam remains with the USACE. The Water Board issued Decision 1100 for Black Butte Dam on September 26, 1962, authorizing the issuance of a water right permit (Application 18115) for domestic, irrigation, municipal, industrial, and recreation purposes for use within the gross place of potential use delineated on Reclamation's maps. Following Water Board Decision 1629, the place of use was amended on July 18, 1994, to include the Contra Costa Water District and nearby areas. The Water Board change order dated April 1, 1996, added fish and wildlife preservation and enhancement as a purpose of use and also added a point of rediversion of storage releases at the Stony Creek Siphon (Constant Head Orifice) into the Tehama-Colusa Canal serving the TCCA.

C.5 Central Valley Project–American River Division

American River Division facilities are operated to improve navigation, regulate the flow of the American River, control floods, and store and convey American River water for irrigation and municipal and industrial (M&I) purposes, power generation, and mitigation, protection and restoration of fish and wildlife. The American River Division includes two active Units: the Folsom Unit and the Auburn-Folsom South Unit. (This Division used to include the Sly Park Unit, but the facilities in that unit were title transferred to El Dorado Irrigation District in 2003 pursuant to the Act of October 27, 2000 (Section 212 of Public Law 106-377)). Major facilities within the Folsom Unit include Folsom Dam, Lake, and Power Plant, Nimbus Dam and Power Plant, Lake Natoma, and the Nimbus Fish Hatchery. The only federally-owned facility within the Auburn-Folsom South Unit is the Folsom South Canal (Sugar Pine Dam was constructed as part

of this unit, but was title transferred to Foresthill Public Utility District pursuant to the Act of December 23, 2000 (Section 503 of Public Law 106-566)).

Facilities within the American River Division were initially authorized by Section 10 of the Flood Control Act of 1944. Five years later, congress enacted the American River Basin Development Act of October 14, 1949, which reauthorized the CVP to include the American River development as described in that Act and declared that Division to be for the same purposes as described and set forth in the 1937 CVP authorization. In 1965, Congress authorized the construction, operation and maintenance of facilities for recreation and fish and wildlife enhancement purposes with the agreement of an appropriate cost-share partner. In that same year, Congress authorized the construction of the Auburn-Folsom South Unit of the CVP.

C.5.1 State Water Resources Control Board Decision 893

In 1958, the Water Board issued Water Right Decision 893 (D-893) approving Reclamation's water rights applications for the consumptive use of American River water. Application 13370 was approved for issuance of a permit for the purpose of irrigation, and Application 13371 was approved for issuance of a permit for municipal, industrial, domestic, and recreation purposes. Downstream points of diversion that are authorized include Folsom South Canal, Contra Costa Canal, the Delta Cross Channel, and the Jones Pumping Plant (Old River Intake and Delta-Mendota Canal).

In D-893, the Water Board approved a total of 1,300,000 acre-feet (af) annually to be collected for storage between about November 1 and about the succeeding July 1, and direct diversion totaling 8,700 cubic feet per second (cfs) between about November 1 and about the succeeding August 1. the Water Board also approved substantially the same quantities of water to be used for power generation. The Applications that were permitted for power use are Applications 13372 and 14662. Application 13372 is authorized for 8,000 cfs by direct diversion year-round and 1,000,000 acre-feet by storage between about November 1 and about the succeeding July 1. Application 14662 is authorized for 300,000 acre-feet of storage between about November 1 to about the succeeding July 1. In D-893, the Water Board also determined the minimum allowable flows in the Lower American River, in the interest of fish conservation, should not ordinarily fall below 250 cfs between January 1 and September 15 or below 500 cfs at other times.

Since issuance of D-893, Reclamation has worked with the Sacramento Water Forum (Water Forum) to develop new flow standards for the lower American River. In July 2006, Reclamation, the Water Forum and other stakeholders completed a draft technical report establishing a flow and temperature regime intended to improve conditions for fish in the lower American River, commonly referred to as the Lower American River Flow Management Standard (FMS). The 2006 FMS prescribed minimum release requirements at Nimbus Dam that take into consideration fall-run Chinook salmon spawning habitat availability, steelhead spawning habitat availability, and juvenile salmon and steelhead rearing habitat conditions.

In 2017, the Water Forum developed a Modified FMS that utilized more recent data obtained during the 2013-2015 drought. The Modified FMS consisted of three components. The Preferred Alternative issued by Reclamation in the February 2020 Record of Decision (ROD) adopted two of the three components: (1) the Lower American River minimum flow requirements and (2) the

Temperature Management Plan for releases from Folsom Dam and Nimbus Dam. The third component established a specified end-of-December lake level, but that component was not adopted by Reclamation. Instead, under the February 2020 ROD, Reclamation adopted a concept for Folsom Reservoir's end-of-year storage called the Planning Minimum. This allowed for a more adaptable and flexible end-of-December Planning Minimum, based on water year type, under which Reclamation plans for a specified amount of carryover storage in Folsom Reservoir, assuming a dry fall, without establishing a hard "cap". Reclamation continues to work with Water Forum on planning minimums, temperature planning, and minimum flow objectives for the American River, but the minimum flows required by D-893 remain the minimum flows mandated by the Water Board for fishery purposes on the American River.

C.5.2 Flood Control

In operating Folsom and Nimbus facilities, Reclamation must comply with flood control regulations established by the U.S. Army Corps of Engineers (USACE) pursuant to Section 7 of the Flood Control Act of 1944, Pub. L. No 78-534, 58 Stat. 887, 890 (1944). The relevant portion of the Act read as follows:

> Hereafter it shall be the duty of the Secretary of War to prescribe regulations for use of storage allocated for flood control or navigation at all reservoirs constructed wholly or in part with Federal funds provided on the basis of such purposes, and the operation of any such project shall be in accordance with such regulations...

The USACE published the original Water Control Manual for Folsom Dam and Lake in October 1956, and revised the manual in March 1959 and December 1987. In the 1987 manual, the USACE prescribed flood control requirements and regulating criteria for October 1 through May 31.

Starting in 1996, Reclamation operated Folsom Dam according to modified flood control criteria, which reserve 400 to 670 thousand acre-feet (TAF) of flood control space in Folsom Lake in combination with empty reservoir space in Hell Hole, Union Valley, and French Meadows, to be treated as if it were available in Folsom Lake. This flood control plan, which provides additional protection for the Lower American River, is implemented through an agreement between Reclamation and Sacramento Area Flood Control Agency.

In 2017, Reclamation and the USACE completed the Folsom Dam Auxiliary Spillway Project, which is also known as the Joint Federal Project or JFP. The JFP greatly reduces flood risk for the Sacramento region by allowing water to be released earlier in a storm and more safely from Folsom Reservoir during high water events while leaving more storage capacity in the reservoir.

In June 2019, the USACE issued a new Folsom Dam and Lake Water Control Manual, which supersedes all prior manuals for Folsom Dam. The new Water Control Manual for Folsom Dam utilizes forecasted inflow as the criteria for determining flood control releases. From October 1 through November 17, the flood control space increases from zero on October 1 to a variable flood space, which ranges from 400 to 600 TAF, on November 18. Starting on November 18, the new manual looks ahead five days and considers the forecasted inflow volume for the total of those five days. If that volume exceeds a threshold, a flood control release is specified. From

March 1 through May 31, the flood control space requirement gradually decreases along with the rain flood potential until zero flood control space is required on June 1.

C.5.3 State Water Resources Control Board Decision 1641

Through State Water Resources Control Board Water Right Decision 1641 (D-1641), the Water Board amended specified water right licenses and permits for the CVP and SWP to require the Projects to meet certain objectives in the 1995 Bay-Delta Water Quality Control Plan (WQCP). Reclamation operates Folsom and Nimbus Dams, in coordination with other CVP and SWP dams and export facilities in the Delta, to release water to assist in meeting various water quality objectives in the Delta. For a more complete discussion of the WQCP and D-1641, please see Section 12, *Bay-Delta Water Quality Control Plan*. D-1641 also amended the purposes of use of Applications 13370 and 13371 to include irrigation, domestic, municipal, industrial, fish and wildlife enhancement, salinity control, water quality control, stock-watering, and recreation purposes, and consolidated the place of use as shown on Reclamation's Map No. 214-208-12581.

C.5.4 Water Supply Contracts

In the American River Division, Reclamation stores and conveys water primarily for M&I purposes through water service and repayment contracts, settlement contracts and Warren Act contracts. Certain water service contracts have been converted to repayment contracts pursuant to the Water Infrastructure Improvements for the Nation (WIIN) Act. All water contracts, including those within the American River Division, are identified in Attachment 2, *CVP Water Contacts Table*, and example American River Division water contracts are included in Attachment 3, *CVP Water Contracts (Examples)*.

Water Service and Repayment Contracts: Reclamation has executed ten water service and repayment contracts that annually provide for the delivery of up to 328,750 acre-feet of Project Water. Reclamation must use "all reasonable means to guard against a condition of shortage" in the amount of Project Water made available for diversion. However, each of these contracts shields Reclamation from any liability if there is a shortage of CVP Water due to a drought or actions taken by Reclamation to meet a relevant legal obligation. Any such shortage will be apportioned among the contractors in the Division or in accordance with the M&I Water Shortage Policy in effect at the time of the shortage.

Water Rights Settlement Contracts: Reclamation administers five contracts that provide for the diversion of non-CVP Water by contractors that hold water rights that are senior to those of the United States. In total, those contracts provide for the annual diversion of up to 310,000 acre-feet of water from the American River and up to 81,800 acre-feet of water from the Sacramento River.[5] Reclamation also administers a Memorandum of Understanding with the California Department of Corrections for the annual diversion of up to 5,000 acre-feet of water for Folsom State Prison. These contracts do not include standard water shortage provisions found in water service contracts, nor do they include Critical Year shortage provisions found in Sacramento River Settlement Contracts and San Joaquin River settlement contracts

[5] The City of Sacramento's settlement contract provides for the diversion of non-Project Water from both the American River and Sacramento River.

Warren Act Contracts: Reclamation administers several Warren Act Contracts that provide for conveyance of non-CVP Water through Excess Capacity in Reclamation facilities, primarily Folsom Dam and Lake and Folsom South Canal. As a matter of contract, the non-CVP water introduced to Folsom Lake must be released within 30 days of introduction or the non-CVP water is deemed to be unused and donated to the United States for project proposes. Since these contracts do not convey CVP Water, Reclamation does not apply water shortage provisions to Warren Act contractors. However, any conveyance is limited to the use of Excess Capacity.

C.5.5 Folsom Unit

C.5.5.1 Folsom Dam, Lake and Powerplant

Folsom Dam, located approximately 30 miles upstream from the confluence with the Sacramento River, is operated as a major component of the CVP. Folsom Dam is a concrete gravity structure that is 340 feet high and 1,400 feet long at its crest. Folsom Lake, created by Folsom Dam, is the largest reservoir in the American River watershed and has a capacity of approximately 967 TAF. Folsom Reservoir is primarily fed by the Upper, Middle and South forks of the American River above Folsom Dam. Folsom Lake is the most popular multiuse year-round unit in the California State Park System. Water from Folsom Dam is released into the lower American River through the river outlets, JFP, and/or the Folsom Powerplant. Additionally, on Folsom Dam there is a water supply intake for local water purveyors who take water supplies that are delivered through the Folsom pumphouse.

Construction of the dam by the USACE began in 1951 with preliminary excavations for the Folsom Power Plant. Water storage in Folsom Lake began in February 1955, and the final concrete in the main dam was poured on May 17, 1955. Following completion, Folsom Dam was transferred to Reclamation in 1956 for operation and maintenance.

During the late 1960s, Reclamation designed a modification to the trash rack structures to provide selective withdrawal capability at Folsom Dam through the Folsom Power Plant. The steel trash racks are now equipped with three groups of shutters. These enable operators to pull water from various elevations, which have different temperatures when the lake is thermally stratified, and blend water at different temperatures to meet downstream temperature requirements.

Folsom Powerplant is located at the foot of Folsom Dam on the north side of the river. Water from the dam is released through three 15-foot-diameter penstocks to three generating units. The installed capacity of the powerplant is 198,720 kilowatts (kw). Power generated at Folsom Dam is dedicated first to meeting the requirements of CVP facilities. The remaining energy is marketed to various preference customers in northern California.

In 2003, at Folsom, the Folsom Urban Water Supply Pipeline (also known as the M&I TCD) became operational. A telescoping control gate allows for selective withdrawal of water to provide additional flexibility to conserve cold water for downstream use. The M&I TCD is operated during the summer months and delivers water that is slightly warmer than that which could be used to meet downstream requirements, but not so warm as to cause significant treatment issues.

In 2017, Reclamation and the USACE completed the JFP, which is an auxiliary spillway that is located adjacent to Folsom's main concrete dam. The JFP includes a 1,100-foot-long approach channel beginning in Folsom Reservoir, a concrete control structure with six bulkhead and six radial gates, a 3,100-foot-long auxiliary spillway chute, and a stilling basin that acts as an energy dissipation structure as water discharges and enters the lower American River. The JFP allows Reclamation to release water earlier during a storm and more safely during high water events, while leaving more storage capacity in Folsom Reservoir.

Water storage volumes and water storage elevations for Folsom Lake for Water Years 2001 through 2022 are presented on Figures C-16 and C-17 (California Department of Water Resources 2023k, 2023l).

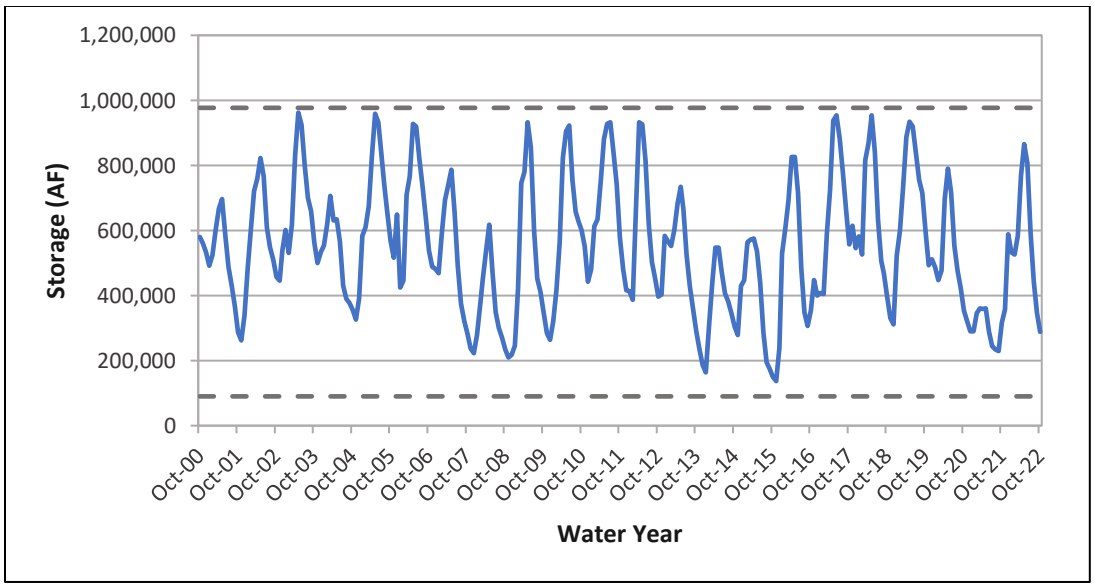

Figure C-16. Folsom Lake Storage

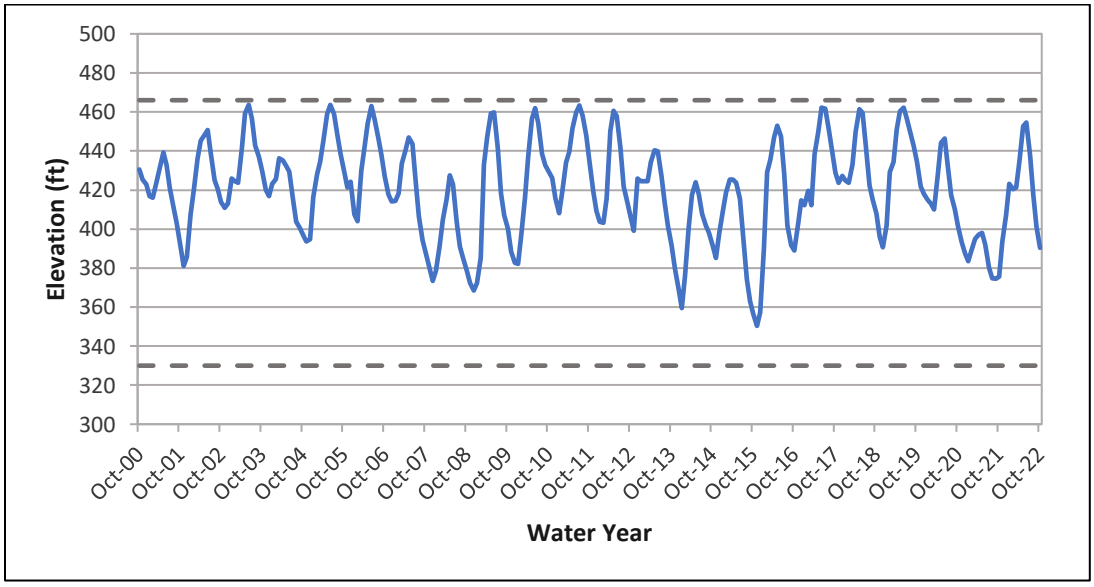

Figure C-17. Folsom Lake Elevation

C.5.5.2 Nimbus Dam, Lake Natoma and Nimbus Powerplant

Nimbus Dam was completed in 1955 and is located approximately seven miles downstream of Folsom Dam on the American River. Nimbus Dam is a concrete gravity structure 87 feet high and 1,093 feet long at its crest. Nimbus Dam creates Lake Natoma, a forebay built to reregulate flows below Folsom Dam and to direct water into the Folsom South Canal. Lake Natoma has a surface area of 540 acres and a capacity of 8,760 acre-feet of water.

Nimbus Dam has 18 radial gates, each 40-feet by 24-feet, that control releases. Nimbus Powerplant is located on the right abutment of the dam, on the river's north side. Its two generators have a capacity of 7,763 kilowatts each. Water is supplied to the two 9,400 horsepower turbines that drive the generators through six 46.5-foot-long penstocks. Releases from Nimbus Dam to the lower American River pass through the Nimbus Powerplant when releases are less than 5,000 cfs or else through the spillway gates for higher flows. Below Nimbus Dam, the lower American River flows approximately 23 miles to the confluence with the Sacramento River.

Water storage volumes and water storage elevations for Lake Natoma for Water Years 2001 through 2022 are presented on Figures C-18 and C-19 (California Department of Water Resources 2023m and 2023n).

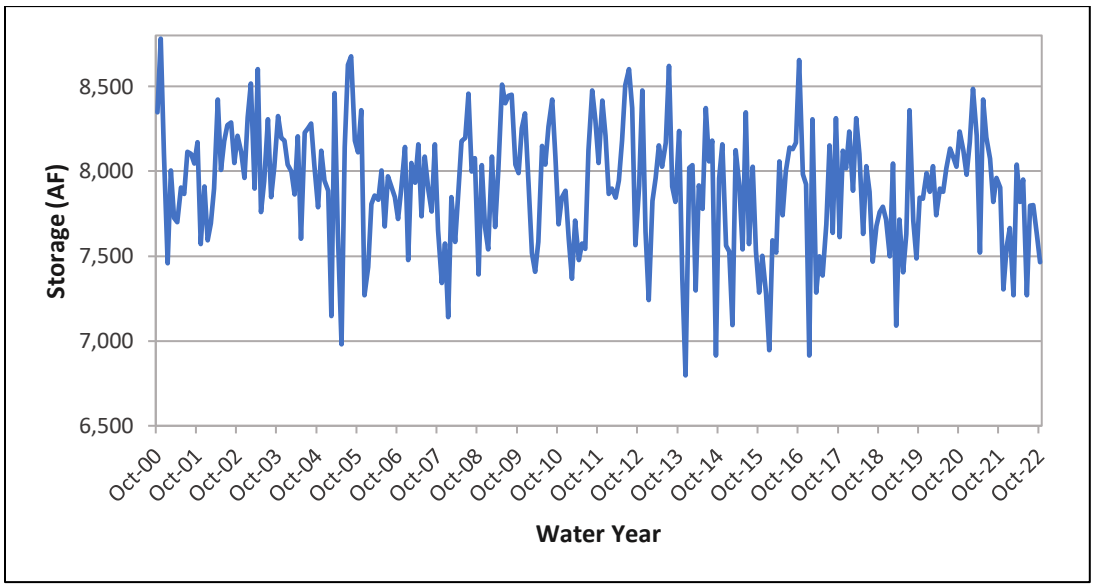

Figure C-18. Lake Natoma Storage

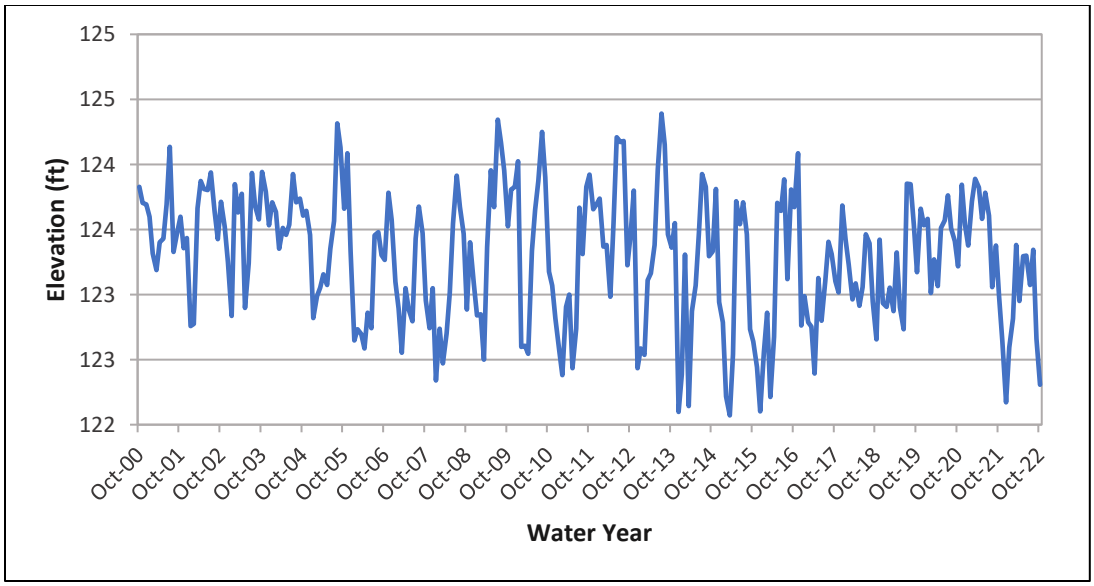

Figure C-19. Lake Natoma Elevation

C.5.5.3 Nimbus Fish Hatchery

The Nimbus Fish Hatchery was authorized by the Fish and Wildlife Coordination Act of 1956. The Hatchery was built by Reclamation to mitigate for steelhead and Chinook salmon habitat loss due to Nimbus Dam's construction. Due to the construction of Nimbus Dam, approximately seven miles of anadromous fish spawning area was inundated and rendered inaccessible to returning fish. The Hatchery is located just downstream of Nimbus Dam and produces both steelhead and Fall-run Chinook salmon.

Reclamation owns the Hatchery, with CDFW operating and maintaining the hatchery facilities since 1956 through a series of agreements executed between Reclamation and CDFW. The latest five-year agreement was executed September 2020. Under the 2020 agreement, the hatchery is to produce sufficient juvenile fish to compensate for the loss of 72% of the historic salmon habitat (about seven miles of riverine habitat above Nimbus Dam). Reclamation's goal is to raise approximately 4,000,000 Chinook salmon smolts and 430,000 steelhead yearlings annually at the hatchery. These yearlings are then released back into the river and Delta helping conserve these vital fish populations for the public. When production rates exceed Nimbus Hatchery production goals, Nimbus Hatchery occasionally will voluntarily transfer excess eggs to other fish hatcheries struggling to meet production goals and ultimately helping others meet production goals.

C.5.6 Auburn-Folsom South Unit

The Auburn-Folsom South Unit was authorized by Section 1 of the Act of September 7, 1965. Initially, the Unit was intended to include Auburn Dam, Reservoir and Powerplant, Sugar Pine Dam and Reservoir, County Line Dam and Reservoir, and the Folsom South Canal. Only Sugar Pine Dam and the Folsom South Canal were constructed.

Sugar Pine Dam is located in North Shirttail Canyon approximately 7 miles north of Foresthill, California. The dam was completed in 1982, and the Foresthill Public Utility District has operated and maintained the dam since 1984. In 2003, title to the facilities were transferred to the Foresthill Public Utility District pursuant to the Act of December 23, 2000 (Section 503 of Public Law 106-566). Sugar Pine Dam is no longer a CVP facility.

C.5.6.1 Folsom South Canal

The Folsom South Canal is the only Federally-owned facility within the Auburn-Folsom South Unit. The canal diverts water from the American River at Nimbus Dam and travels about 26.7 miles in a southerly direction, terminating about 10 miles northeast of Lodi, California. The canal was initially authorized by the American River Development Act of 1949 (see above). Additional authorization for the canal was included in Section 1 of the Act of September 2, 1965. Construction of the canal began on July 28, 1952, but work on the main section of the canal did not begin for almost 20 years after, and the first water delivery was on June 27, 1973.

The canal delivers water to several water users for M&I purposes who hold water repayment and settlement contracts with the United States. The three repayment contracts provide for the delivery of up to 193,000 acre-feet annually of Project Water, while two settlement contracts provide for the delivery of up to 15,000 acre-feet annually of Non-Project Water. Most of those contractors rely on American River water that is diverted at Nimbus Dam into the Folsom South Canal. One of the contractors, East Bay Municipal Utility District (EBMUD), may divert up to 133,000 acre-feet of Sacramento River water at Freeport to the Folsom South Canal, where it moves by pipeline to the Mokelumne Aqueduct. In accordance with its contract, EBMUD may only divert this water when "the Contractor's March 1 forecast of its October 1 Total System Storage, as revised monthly through May 1 is less than 500,000 acre-feet based on a 50 percent exceedance, or any different reasonable exceedance used by the Contractor to declare rationing within the Contractor's Water Service Area, or as otherwise agreed to by the parties (referred to as the TSS forecast). The entitlement shall not exceed a total of 165,000 acre-feet of Water delivered in any three consecutive Year period that the Contractor's Total System Storage forecast remains below 500,000 acre-feet."

C.6 Central Valley Project–Friant Division

Friant Division facilities are operated to improve navigation, provide flood control, regulate the flow of the San Joaquin River, and for the direct delivery of water and delivery of stored water for irrigation and M&I uses, and mitigation, protection and restoration of fish and wildlife.

The Friant Division was authorized in the 1937 Rivers and Harbors Act and includes Friant Dam and Millerton Lake, the Madera Canal, and the Friant-Kern Canal. Friant Dam is located on the San Joaquin River near Friant, CA. The San Joaquin River flows for approximately 366 miles from the highest peaks in the Sierra Nevada Mountains above 11,000 feet in elevation to the Delta. Flows in the upper San Joaquin River are regulated by Friant Dam, which forms Millerton Lake. Flows downstream of Friant Dam are also influenced by flows from tributary rivers and streams, as described below, including CVP operations of New Melones Reservoir on the Stanislaus River.

In order to construct and operate the Friant Division for CVP purposes, the United States purchased, settled and exchanged certain water rights necessary for the storage, diversion and use of the waters of the San Joaquin River. In 1939, the United States entered into the Contract for Purchase of Miller and Lux (M&L) Water Rights, July 27, 1939, Contract No. I1r-1145 (Purchase Contract). Through that contract, the United States obtained the right to store, divert and use waters of the San Joaquin River for the CVP and specifically, the Friant Division, subject to the reserved flow rates identified in Schedules 1 and 2 to the Purchase Contract for use by M&L.

Pursuant to Article 11 of the Purchase Contract, the United States also acquired all rights of M&L pertaining to storage and power release contracts for locations upstream of Friant Dam. Consequently, the United States entered into the Operating Contract Relating to Southern California Edison Company's (SCE) Mammoth Pool and Existing Projects on the San Joaquin River (Mammoth Pool Agreement), dated June 1, 1957. Pursuant to the Mammoth Pool Agreement, Southern California Edison may store and release water subject to hydrologic conditions. Among those conditions, when the computed natural runoff at Friant Dam from April 1 through July 31 is not more than 650,000 acre-feet, SCE's storage at the end of the water year shall not exceed 152,500 acre-feet.

Along with the Purchase Contract, the United States entered into a Contract for the Exchange of Waters dated July 27, 1939 (Contract No. I1r-1144). The parties to the Exchange Contract are the United States and San Joaquin & Kings River Canal & Irrigation Company, Inc., Columbia Canal Company, San Luis Canal Company, and Firebaugh Canal Company. The 1939 Exchange Contract has been superseded by the Second Amended Exchange Contract, dated February 14, 1968. The terms of the Second Amended Exchange Contract are summarized in Section 3 – Delta Division.

C.6.1 State Water Resources Control Board Decision 935

On June 2, 1959, the Water Board issued Water Right Decision 935 (D-935) authorizing the issuance of three permits associated with Reclamation's water right Applications 234, 1465, and 5638 for the direct diversion and storage of water from the San Joaquin River at Friant Dam.

D-935 also approved Reclamation's petition regarding Application 23 (License 1986) to move the point of direct diversion to Friant Dam and to establish Reclamation's Potential Service Area indicated on Map 214-212-37 as the authorized place of use. License 1986 was authorized for the direct diversion of San Joaquin River water at Friant Dam from about April 1 to about the following July 1 for domestic and irrigation purposes.

Permits issued for Applications 234 and 1465 each authorizes a maximum direct diversion rate of 3,000 cfs from about February 1 to about the following October 31, and 500,000 acre-feet of storage from about November 1 to about the following August 1; the maximum annual diversion shall not exceed 2,124,487 acre-feet. The permit issued for application 5638 authorizes a maximum direct diversion rate of 3,000 cfs from February 1 to the following October 31, and 1,210,000 acre-feet of storage from November 1 to the following August 1. The maximum combined direct diversion rate under Applications 234, 1465, and 5638 shall not exceed 6,500 cfs.

These three permits and one license constitute the water rights issued by the State Water Board for the operation of Friant Dam and the associated beneficial use of San Joaquin water. D-935 disapproved the direct diversion of San Joaquin River water downstream of Friant Dam. The three permits provide that the Water Board retains continuing jurisdiction over the permits for such period as may be necessary for the purpose of conforming those water rights with the provisions of the final judgment in Rank v, Krug, No. 685- ND, United States District Court, Southern District of California, Northern Division (now the Eastern District of California).

C.6.2 State Water Resources Control Board Order Dated October 21, 2013

On October 21, 2013, the Water Board issued an Order Approving Change and Instream Flow Dedication for the three water right permits and one license. The Order was accompanied by three amended permits and one amended license; the amendments authorized all four water rights for the beneficial use of water for instream purposes pursuant to Cal. Water Code Section 1707 in furtherance of implementation of the San Joaquin River Restoration Program (P.L. 111-11). The Order also specifically authorized certain points of rediversion of instream flows (i.e. to recapture these instream flows) below Friant Dam for all four water rights and did not change the requirement under D-935 that no flows be directly diverted below Friant Dam. The lowermost point of rediversion is on the San Joaquin River below Vernalis at Banta Carbona Irrigation District, although rediversion is authorized further downstream at the Jones and Banks Pumping Plants and at San Luis Dam.

The amendments also consolidated the places and purposes of use for all four water rights. Just prior to this Order, all four water rights were authorized for domestic and irrigation purposes, with License 1986 also authorized for stock watering and Application 5638 alone also authorized for municipal and recreational purposes. Also, the authorized places of use for License 1986 and Applications 234 and 1465 were in accordance with Map No. 214-208-3331; the only Application authorized for municipal and recreational use, 5638, had a more limited authorized place of use, mainly in accordance with Map No. 214-212-37. After this Order, all four water rights now also share the same place of use as indicated on Map No. 1785-202-50 and all are now authorized for all the above purposes of use as well as for fish and wildlife preservation and enhancement.

C.6.3 State Water Resources Control Board D-1641

Certain flow, water quality, and monitoring included in D-1641 apply to the San Joaquin River below Friant Dam. For a complete list of water quality objectives in D-1641 that apply to the San Joaquin River, please see Tables 1-3 of D-1641.

C.6.4 Flood Control

Friant Dam is the principal flood damage reduction facility on the San Joaquin River and is operated to maintain releases to the San Joaquin River, combined with flows from Cottonwood Creek and Little Dry Creek, at or below a flow objective of 8,000 cfs. From spring to early fall (April through September) there are no flood control restrictions (top of conservation storage is at gross pool). During the spring months reserving storage capacity for flood control varies as a function of date and hydrologic conditions with up to 170,000 acre-feet reserved for flood

management (top of conservation storage furthest below gross pool). Up to 85,000 acre-feet of this required flood management space may be provided in Mammoth Pool, located upstream.

Some flood events in the past few decades have resulted in flows greater than 8,000 cfs downstream from Friant Dam and, in some cases, flood damages resulted, most notably in 1997. Flood control storage space in Millerton Lake is based on a complex formula, which considers storage in upstream reservoirs, forecasted snowmelt, and time of year. Flood management releases occur approximately once every 4 years and are managed based on downstream channel design capacity to the extent possible.

C.6.5 The San Joaquin River Restoration Program

In 2006, parties to *NRDC, et al., v. Rodgers, et al.* executed a stipulation of settlement that called for a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of the Merced River and a self-sustaining Chinook Salmon fishery while reducing or avoiding adverse water supply impacts. The San Joaquin River Restoration Program implements the settlement consistent with the San Joaquin River Restoration Settlement Act in Public Law 111-11. Reclamation, along with the DWR as the lead agency for CEQA, prepared a Final PEIS/R for the San Joaquin River Restoration Program , dated July 31, 2012. The Final PEIS/R presents two levels of analyses, program-level and project-level, for the various action alternatives. On September 28, 2012, Reclamation issued a ROD for the San Joaquin River Restoration Program. The USFWS issued a Programmatic Biological Opinion for the implementation of the San Joaquin River Restoration Program on August 21, 2012, and NMFS issued a Programmatic Biological Opinion on September 18, 2012, for San Joaquin River Restoration Program flow releases of up to 1,660 cfs from Millerton Lake into the San Joaquin River.

The San Joaquin River Restoration Program Restoration Area (San Joaquin River from Friant Dam to the Merced River Confluence) includes five distinct reaches of the San Joaquin River as well as portions of the flood management system that include the Chowchilla, Eastside, and Mariposa Bypasses. These reaches are defined as follows: Reach 1, Friant Dam to Gravelly Ford; Reach 2, Gravelly Ford to Mendota Dam; Reach 3, Mendota Dam to Sack Dam; Reach 4, Sack Dam to Eastside Bypass Confluence; and Reach 5, Eastside Bypass Confluence to Merced River. The settlement-required flow targets for releases from Millerton Lake include six water year types for releases depending upon available water supply as measures of inflow to Millerton Lake. The Millerton Lake releases include the flexibility to reshape and retime releases forwards or backwards by 4 weeks during the spring and fall pulse periods. Flood flows may potentially occur and meet or exceed the Settlement flow targets. If flood flows meet the settlement flow targets, then Reclamation would not release additional water from Millerton Lake. The San Joaquin River channel downstream of Friant Dam currently lacks the capacity to convey flows to the Merced River and releases are limited accordingly.

Reclamation is required, pursuant to its water right permits and license for operation of Friant Dam, to dedicate water to instream beneficial uses to the extent possible consistent with the State Water Resources Control Board Order authorizing releases to implement the San Joaquin River Restoration Program and terms and conditions of the Settlement and Settlement Act. Only water available at Friant Dam may be dedicated for fish and wildlife purposes pursuant to Cal. Water

Code Section 1707. Release rates are required to be in accordance with the schedule for release volumes of Restoration Flows as described in the water right permits and license (referencing Table 2-4 of the Final PEIS/R for the San Joaquin River Restoration Program) or released as scheduled by the Restoration Administrator (an independent court-appointed position selected by the Settling Parties).

C.6.6 Water Supply Contracts

Within the Friant Division, Reclamation provides Class 1 and Class 2 water to repayment contractors that divert water from Millerton Lake, the Friant-Kern Canal, and the Madera Canal for agricultural and M&I purposes. Reclamation also operates Friant Dam to release water to water users that executed Holding Contracts with the United States. Additionally, under limited, specified conditions, Reclamation may release water from Friant Dam to meet the demands of Exchange Contractors (the Exchange Contracts are discussed in Section 3)

Repayment Contracts: There are numerous contracts that provide for the delivery of water from Millerton Lake, the Friant-Kern Canal, and the Madera Canal. Each of these contracts has been converted from water service to repayment under the San Joaquin River Restoration Settlement Act, Public Law 111-11. Those contracts provide for the annual delivery of up to 800,000 acre-feet of Class 1 water and 1,326,675 acre-feet of Class 2 water. Class 1 water is "water stored in or flowing through Millerton Lake which will be available for delivery from Millerton Lake and the Friant-Kem and Madera Canals as a dependable water supply during each year." Class 2 water "can be made available . . . for delivery from Millerton Lake and the Friant-Kern and Madera canals in addition to the supply of Class 1 water. Class 2 water is "undependable" and is only furnished when Reclamation determines it is available, primarily during the spring and early summer months.

During "uncontrolled season", Reclamation has determined that a need exists to evacuate water from Millerton Lake to prevent or minimize spill or to meet flood control criteria. An allocation process is conducted for delivery of water during an uncontrolled season. When Reclamation has determined that the threat of spill has been eliminated and that Millerton Lake is under control and/or flood control criteria has been met, Reclamation terminates the uncontrolled season.

Holding Contracts: The United States also entered into a number of "Holding Contracts" of which there are 128 active Holding Contracts. Most are for small parcels under 100 acres, although there are a few with over 1,000 acres. These contracts act as a settlement for certain landowners along the San Joaquin River from Friant Dam to Gravelly Ford that could assert that they hold water rights from the San Joaquin River and that the operation of Friant Dam would impact their use of water from the San Joaquin River for irrigation purposes. Through these contracts, the United States retained the right to use water from the Friant Division for CVP purposes, subject to the requirement to permit water to pass by or through Friant Dam into the San Joaquin River, together with accretions to the San Joaquin River from all sources, will maintain a "live stream" of 5 cfs at stated "control points" along the river. The furthest downstream control point being located at Gravelly Ford. The United States is obligated to provide this live stream except for causes beyond its control and to use due diligence to perform this obligation.

C.6.7 Friant Dam and Millerton Lake

Friant Dam is located on the San Joaquin River, 25 miles northeast of Fresno, California. Completed in 1942, the dam is a concrete gravity structure, 319 feet high, with a crest length of 3,488 feet. The dam controls San Joaquin River flows, provides downstream releases to meet requirements above Mendota Pool, and provides flood control, conservation storage, diversion into Madera and Friant-Kern Canals, and delivery of water to a million acres of agricultural land in Fresno, Kern, Madera, and Tulare Counties in the San Joaquin Valley.

The reservoir at Friant Dam, Millerton Lake has a total active storage capacity of 520,500 acre-feet, a surface area of 4,905 acres, and is approximately 16 miles long. The minimum operating storage of Millerton Lake is 135,000 acre-feet, resulting in active available conservation storage of about 385,500 acre-feet. The minimum operating storage allows for diversion from dam outlets to the Friant-Kern Canal (associated with elevation 468.7), Madera Canal (elevation 448.6), and the San Joaquin River outlet works (elevation 382.6).

Recent water storage volumes and elevations for Water Years 2001 through 2022 in Millerton Lake are presented on Figures C-20 through C-21 (California Department of Water Resources 2023o, 2023p). Outflow from Millerton Lake for these Water Years is presented in Figure C-22 (California Department of Water Resources 2023q).

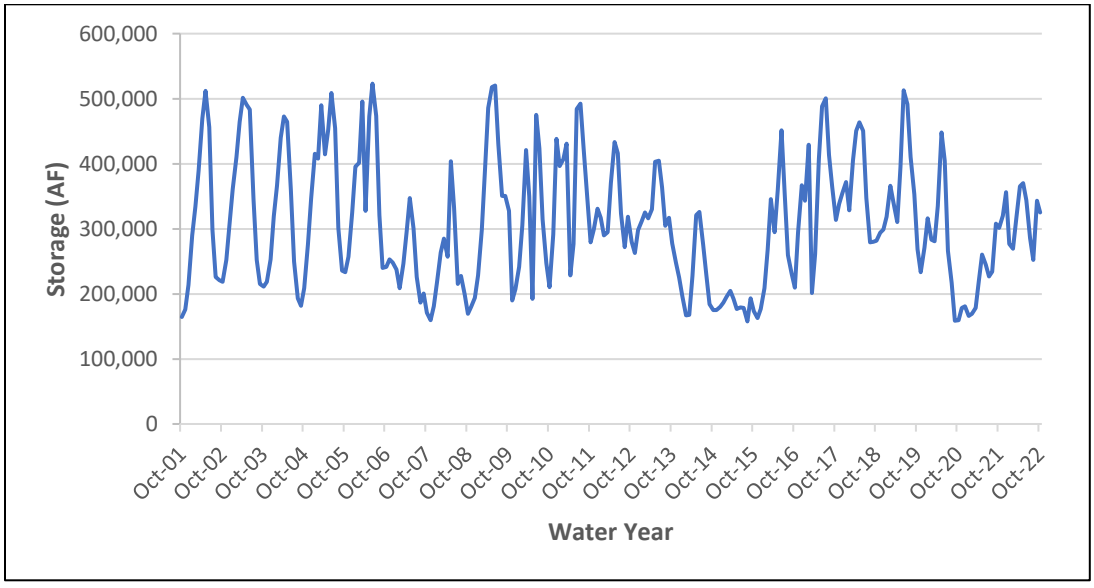

Figure C-20. Millerton Lake Storage

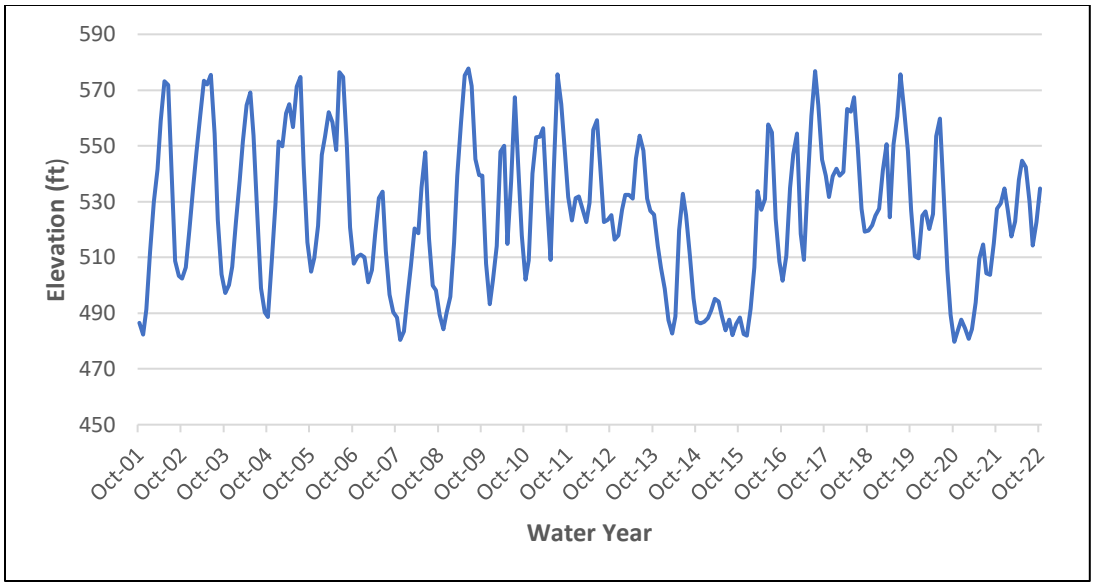

Figure C-21. Millerton Lake Elevation

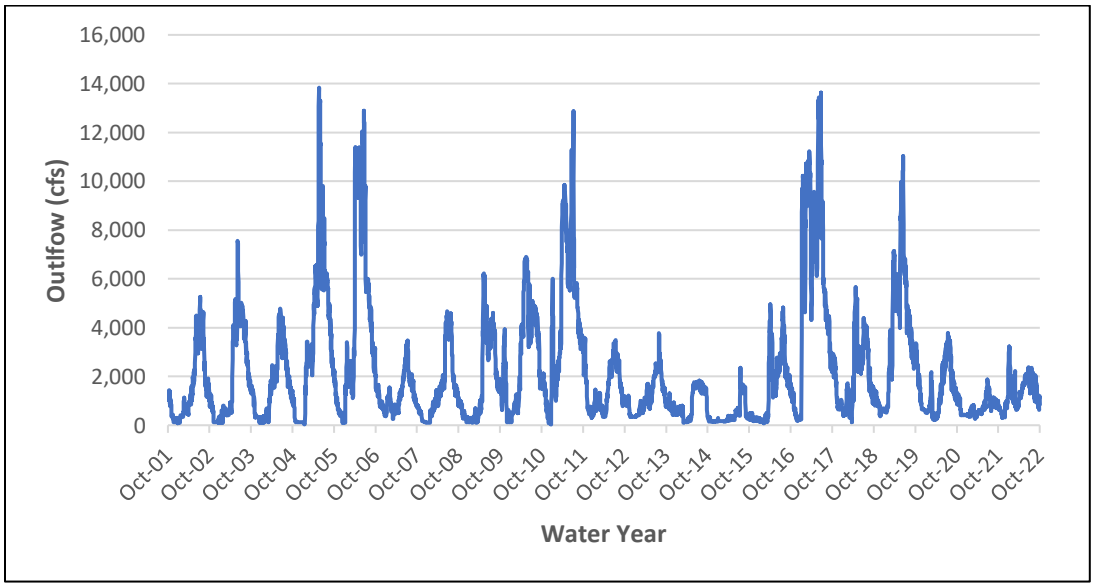

Figure C-22. Millerton Lake Outflow

There are three separate river and canal outlets: the river outlet works, the Friant-Kern Canal, and the Madera Canal. The river outlet works are four 110-inch-diameter steel pipes through Friant Dam that are controlled by four 96-inch-diameter hollow-jet valves at the outlet ends. The valves release water down a chute and into a stilling basin, which dissipates the water´s energy. The capacity of the four hollow-jet valves is 16,400 cfs at top of active storage; however, releases for instream flows (i.e. San Joaquin River Restoration Program flows) and downstream holding contracts ranges from 350 to 2,500 cfs for most periods. Small releases to the river are routed through a bifurcation on Penstock 1 to a pair of hydropower generators operated by the Friant Power Authority. The tailrace from these generators returns the water to the river. Up to 55 cfs is also routed through the California Department of Fish and Wildlife Trout Hatchery and

Salmon Conservation Facility. Additionally, two 24-inch-diameter steel pipes branching from Penstocks 3 and 4 are configured with two 18-inch-diameter needle valves to provide additional low flow discharge capability at the river outlet works. The two canal outlets are discussed below.

C.6.8 Madera Canal

The Madera Canal was authorized by the Rivers and Harbors Act of 1937. The canal is 35.9 miles long and carries water from outlet works located on the right abutment northerly from Millerton Lake. The canal furnishes water to lands in Madera County with a supplemental and a new irrigation supply. The canal, completed in 1945, has an initial capacity of 1,000 cfs, decreasing to a capacity of 625 cfs at the Chowchilla River. In 1965, the canal lining from the headworks to milepost 2.09 was raised so that 1,250 cfs could be delivered. The canal bottom width varies from 8 to 10 feet in the concrete-lined sections and from 20 to 24 feet in the earth-lined sections. The water depth varies from 7 to 9 feet in all sections. Water ran for the first time through the entire length of Madera Canal on June 10, 1945, and deliveries were made a month later.

C.6.9 Friant-Kern Canal

The Friant-Kern Canal carries water over 151.8 miles from outlet works located on the left abutment in a southerly direction from Millerton Lake to the Kern River, four miles west of Bakersfield. The water is used for supplemental and new irrigation supplies in Fresno, Tulare, and Kern Counties. Construction of the canal began in 1945 and was completed in 1951. The canal has an initial capacity of 5,500 cfs that gradually decreases to 2,000 cfs at its terminus in the Kern River.

C.7 Central Valley Project–Eastside Division- New Melones Unit

Eastside Division facilities are operated for flood control, direct delivery of water and delivery of stored water for irrigation and M&I uses, power generation, and mitigation, protection and restoration of fish and wildlife. The East Side Division encompasses portions of the Stanislaus and San Joaquin River Systems and includes New Melones Dam, Tulloch Dam, and Goodwin Dam. All three dams are located along the Stanislaus River, but New Melones Dam and Reservoir are the only facilities that are owned and operated by the United States within the Eastside Division.

The Stanislaus River originates in the western slopes of the Sierra Nevada and drains a watershed of approximately 900 square miles. The median annual unimpaired runoff in the basin is approximately 1.08 MAF per year (State Water Resources Control Board 2012). Snowmelt from March through early July contributes the largest portion of the inflow into New Melones Reservoir, with the highest runoff occurring in the months of April, May, and June.

C.7.1 Flood Control

New Melones Dam was constructed to prevent the flooding of 35,000 downstream acres of agricultural land and communities. During the Summer months (June through September), there are generally no flood control restrictions. During the Fall through Spring months, reserving storage capacity for flood control varies as a function of date and hydrologic conditions with up to 450,000 acre-feet reserved for flood control management.

The New Melones Reservoir flood control operation is coordinated with the operation of Tulloch Reservoir. The flood control objective is to maintain flood flows at the Orange Blossom Bridge at a stage of 13.0 feet which corresponds with a flow of approximately 8,000 cfs. When possible, however, releases from Tulloch Dam are maintained at levels that would not result in long-term downstream flows in excess of 1,500 cfs because of the past reported potential for seepage in agricultural lands adjoining the river associated with flows above this level. An amount of 10, 000 acre-feet of Tulloch Reservoir storage is set aside for flood control. Based upon the flood control diagrams prepared by USACE, part, or even all, of the dedicated flood control storage may be used for conservation storage (storing allocated, excess waters), depending on the time of year and the current flood hazard.

C.7.2 State Water Resources Control Board Permits and Applications

On April 4, 1973, the Water Board issued Water Right Decision 1422 (D-1422), authorizing the issuance of permits associated with Reclamation's water right applications 14858, 14859, 19303, and 19304. These permits authorize diversion at New Melones Dam and are the subject of later amendments.

Water Board Water Right Decision 1644 (D-1644, issued on January 21, 1988, assigned the direct diversion portion under Application 14858 to a separate permit (Application 14858A). Application 14858A authorized up to 980,000 acre-feet for diversion from November 1 to the following June 30 for various purposes, including irrigation, domestic, municipal, industrial purposes in primarily Calaveras, Stanislaus, Tuolumne, and San Joaquin Counties, as well as water quality control, fish and wildlife preservation and enhancement, and recreational purposes from New Melones Reservoir to downstream reaches of the Stanislaus and San Joaquin Rivers. Application 14858B authorized up to 1,000,000 acre-feet for diversion to storage from November 1 to the following June 30 for irrigation, domestic, municipal, and industrial, as well as water quality control, fish and wildlife preservation and enhancement, and recreational purposes in the Stanislaus and San Joaquin Rivers downstream of New Melones Dam.

Two other amendments addressed power generation. Application 14859 was permitted on July 25, 1983, and is authorized for the purpose of power generation. Up to 6,000 cfs is authorized for direct diversion year-round and up to 980,000 AF by storage from November 1 to the following June 30. Application 27319 was permitted pursuant to Water Board Water Right Decision 1616 (D-1616) on July 18, 1988, and is authorized for the purpose of power generation. Up to 4,000 cfs is authorized for direct diversion year-round.

Terms and conditions of Reclamation's water rights define the limitations within which Reclamation can directly divert water or divert water to storage, after senior water rights and in-basin demands are met. Senior water rights include both current and future upstream water right

holders (whose priority is reserved in D-1422 and D-1616 and through protest settlement agreements with Tuolumne and Calaveras Counties), and current downstream water right holders and riparian rights (whose priorities are either senior to Reclamation or senior to appropriative rights in general, respectively). Additionally, New Melones operations are affected by not only Stanislaus River requirements, but San Joaquin River requirements.

C.7.3 Requirements for the Lower Stanislaus River

Based on a protest settlement agreement between Reclamation and CDFW in 1987, D-1422 required Reclamation to bypass or release 98,000 acre-feet of water per year (69,000 acre-feet in critical years) through New Melones Reservoir to the Stanislaus River on a distribution pattern to be specified each year by CDFW for fish and wildlife purposes. Based on a second protest settlement agreement in 1987, D-1616 as amended required increased releases from New Melones to enhance fishery resources for an interim period, during which habitat requirements were to be better defined and a study of Chinook Salmon fisheries on the Stanislaus River would be completed.

During the study period, releases for instream flows were to range from 98.3 to 302.1 TAF per year. The exact quantity to be released each year was to be determined based on a formulation involving storage, projected inflows, projected water supply, water quality demands, projected CVP contractor demands, and target carryover storage. Because of dry hydrologic conditions during the 1987 to 1992 drought period, the ability to provide increased releases was limited. USFWS published the results of a 1993 study, which recommended a minimum instream flow on the Stanislaus River of 155.7 TAF per year for spawning and rearing (U.S. Fish and Wildlife Service 1993).

As of 2022, Reclamation had completed six out of the seven studies needed toward answering the 1987 elements to show relationships between streamflow and suitable habitat conditions for Chinook salmon. Element 6, Temperature Stations and Modeling, remains to be completed. More recently, Reclamation has proposed to implement the New Melones Stepped Release Plan (SRP) for New Melones Dam and Reservoir operations (as measured at Goodwin Dam). The SRP annual releases vary with hydrologic condition and water year type..

Reclamation's New Melones water rights require that water be bypassed through or released from New Melones Reservoir to maintain applicable dissolved oxygen (DO) standards to protect the salmon fishery in the Stanislaus River. D-1422 provides that a dissolved oxygen concentration be maintained in the Stanislaus River as specified in the Water Quality Control Plan (Interim), San Joaquin River Basin 5C, Water Board, June 1971, and that if that plan is amended the objective shall be modified to conform to current criteria. D-1641 modified the applicable DO concentration standard for Applications 14858A and 19304 (New Melones storage) as specified in the Water Quality Control Plan for the Sacramento and San Joaquin River basins. The 2004 San Joaquin Basin 5C Plan (Central Valley Regional Water Quality Control Board) designates the lower Stanislaus River with cold water and spawning beneficial uses, which have a general water quality objective of no less than 7 milligrams per liter (mg /L DO. This objective is therefore applied through the water rights to the Stanislaus River near Ripon.

C.7.4 Requirements for the Lower San Joaquin River

New Melones is also operated to assist in meeting certain downstream requirements for the San Joaquin River. D-1641 requires Reclamation to meet the 1995 Bay-Delta Plan objectives at Vernalis by imposing Vernalis flow and salinity requirements for the San Joaquin Basin. It also includes requirements at Vernalis for both base flows and a large spring pulse flow, however it did not address how the requirement would be shared between the three major San Joaquin tributaries.

D-1422 orders that releases from New Melones Reservoir shall be scheduled to maintain a mean monthly total dissolved solids concentration in the San Joaquin River at Vernalis at 500 parts per million. Order 95-6, followed by D-1641, modified this requirement at Vernalis, to require a maximum 30-day running average of mean daily electrical conductivity (EC, mmhos/centimeter) of 0.7 April through August and 1.0 September through March, in all water year types.

D-1641 orders that Reclamation meet flow requirements on the San Joaquin River at Vernalis. Minimum average monthly flow values corresponding to water year type and time period are provided in Table 3 attached to the order.

C.7.5 Water Supply Contracts

Water Repayment Contracts: Reclamation administers two repayment contracts within the Eastside Division. In 1983, Reclamation executed two water service contracts with Stockton East Water District and Central San Joaquin Water Conservation District. Those two contracts provide for the annual delivery of up to 155,000 acre-feet of water for irrigation and M&I purposes. Those contracts shield Reclamation from any liability caused by a shortage of water resulting from drought or any action of Reclamation to comply with a legal obligation. Both contracts have been converted to repayment contracts under the WIIN Act.

***Water Rights Settlement Agreement*:** Reclamation's application for assignment of state water right filings in the early 1970s was protested by future in-basin users and senior water rights holders. To resolve the senior water rights protest, Reclamation entered into a 1972 Agreement and Stipulation with the Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID). That agreement was updated in 1988, and commits Reclamation to provide water in accordance with a formula based on inflow and storage of up to 600,000 af each year for diversion at Goodwin Dam by OID and SSJID. Article 1 of the 1988 agreement requires Reclamation to deliver at Goodwin Dam the "inflow to New Melones plus the amount derived by the following formula: (600,000 - inflow) divided by 3: limited to a maximum entitlement of 600,000 acre-feet of water each water year." Inflow is calculated as "the total inflow into New Melones Reservoir during the water year, expressed in acre-feet, as computed by [Reclamation] . . . in consultation with the Districts." The 1988 Agreement and Stipulation created a "conservation account" in which the difference between the entitled quantity and the actual quantity diverted by OID and SSJID in a year may be carried over for use in subsequent years, depending on storage/flood control conditions in New Melones. This conservation account has a maximum volume of 200 TAF, and withdrawals are constrained by criteria in the agreement.

C.7.6 New Melones Dam and Reservoir

New Melones was originally authorized by the Flood Control Act of 1944, and reauthorized by the Flood Control Act of 1962. New Melones Dam is located on the Stanislaus River off Highway 49, some 8 miles north of Sonora and 6 miles south of Angels Camp. The USACE began building New Melones in 1966 and completed the dam in 1978 and the spillway and powerhouse in 1979. Following construction. the USACE transferred the project to Reclamation. When the dam was built and the reservoir filled, the 211-foot-high old Melones Dam, built in 1926 by OID and SSJID to provide water for agriculture, was inundated.

New Melones Dam is an earth and rock embankment dam with a crest elevation of 1135.0 feet and a crest length of 578.0 feet. The top of active conservation pool is at elevation 1049.5 feet and the top of inactive pool conservation is at 808.0 feet. The spillway crest elevation is at elevation 1088.0 feet and the top of dead storage pool is at elevation 543.0 feet. The spillway capacity at elevation 1123.4 feet is 112,600 cfs. The outlet works capacity at elevation 1088.0 feet is 8,300 cfs. The two irrigation districts (OID and SSJID) that built the original old Melones Dam own and operate the downstream Goodwin Diversion Dam, which diverts Stanislaus River water into the districts' canal and Tulloch Dam, Reservoir and Powerplant, located immediately downstream from New Melones Dam. Tulloch Reservoir provides afterbay storage for reregulating power releases from New Melones Powerplant under a contract between Reclamation and the two districts. Water re-regulated at Tulloch Reservoir is either diverted at Goodwin Dam or released from Goodwin Dam to the lower Stanislaus River. The New Melones powerplant has a generating capacity of 322,596,000 kWh. New Melones Reservoir has a total surface area of 12,500 acres and a total capacity of 2,400, 000 acre-feet.

Reservoir storage varies in accordance with upstream hydrology and downstream water demands and instream flow requirements. Recent water storage volumes and elevations for Water Years 2001 through 2022 in New Melones and Goodwin reservoirs are presented on Figures C-22 through C-25 (California Department of Water Resources 2023r, 2023s, 2023t, 2023u). Recent mean daily flows in the Stanislaus River downstream of Goodwin Dam are presented on Figure C-26 (California Department of Water Resources 2023v).

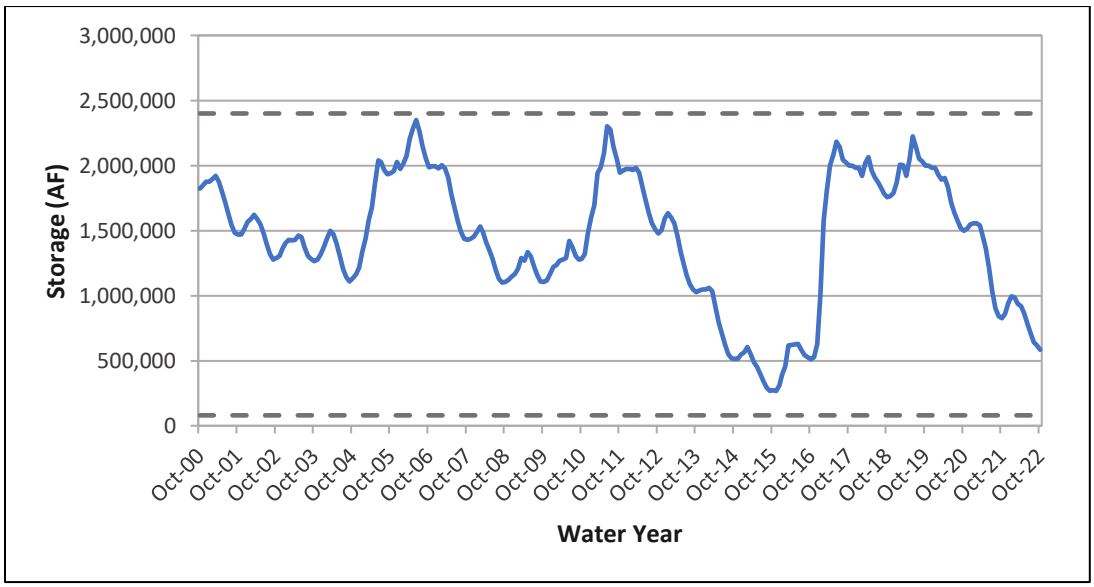

Figure C-22. New Melones Reservoir Storage

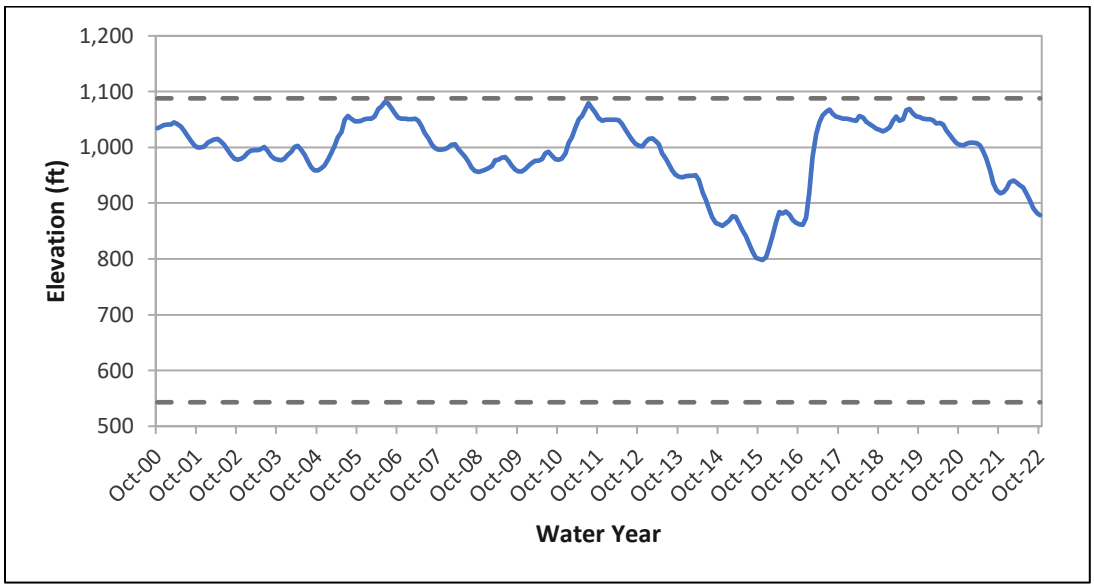

Figure C-23. New Melones Reservoir Elevation

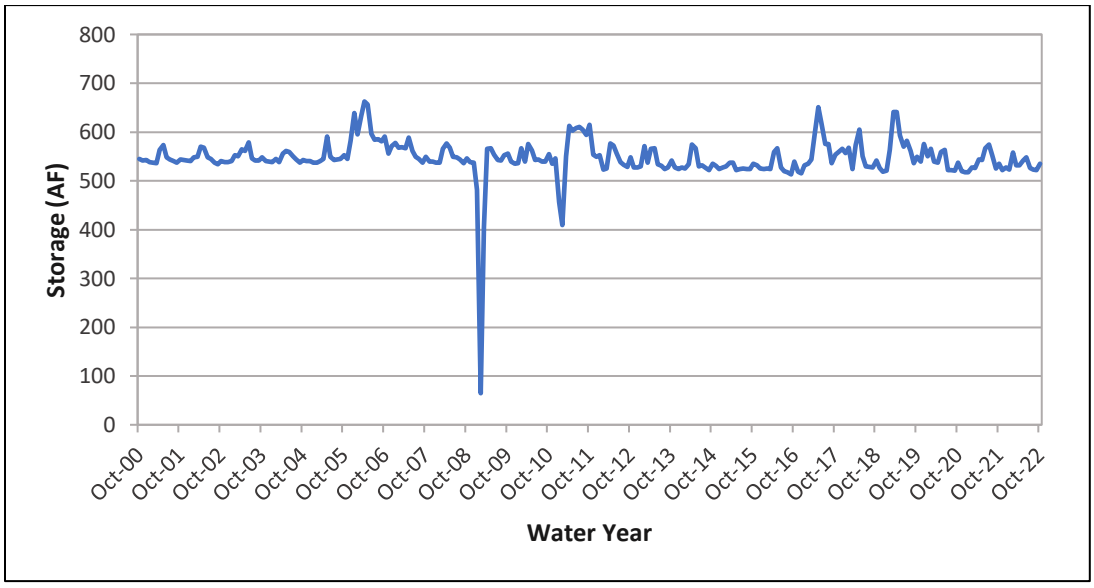

Figure C-24. Goodwin Reservoir Storage

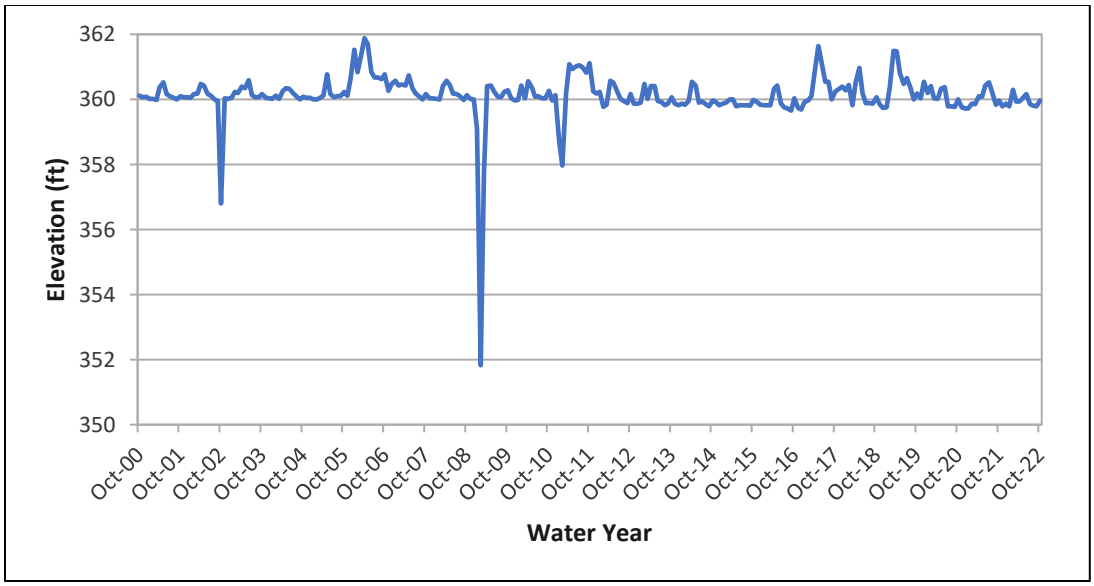

Figure C-25. Goodwin Reservoir Elevation

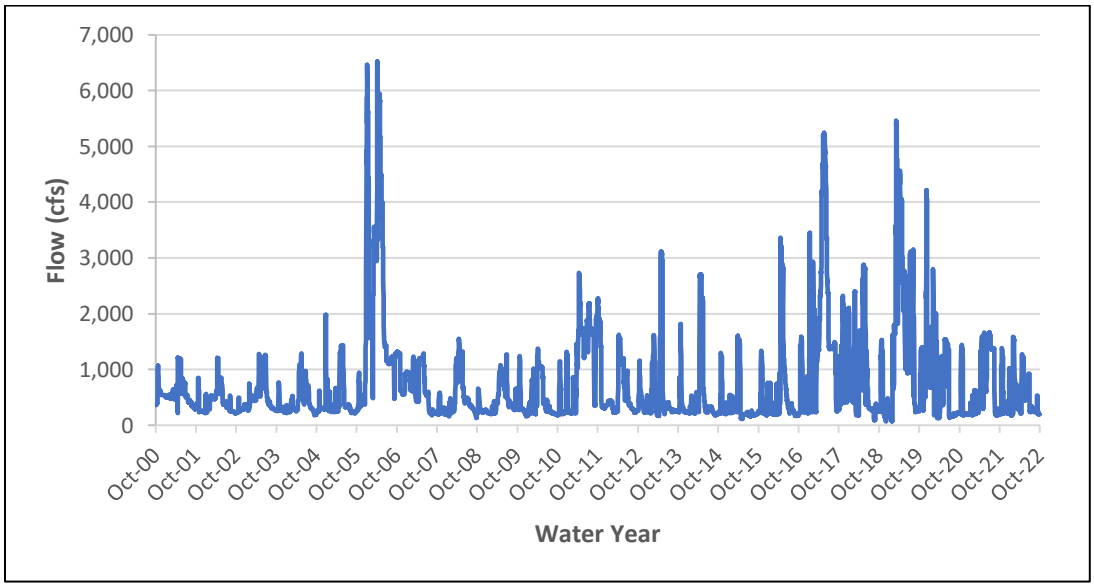

Figure C.-26. Stanislaus River at Orange Blossom Bridge

C.8 Central Valley Project–Delta Division

Delta Division facilities regulate a portion of the flows in the Delta, control floods, route the flow of water in the Delta, provide storage, and convey water from the Delta to the San Joaquin Valley, Santa Clara Valley, Contra Costa County, and San Benito County for irrigation and M&I uses, power generation, and mitigation, protection, and restoration of fish and wildlife resources. Facilities within the Delta Division include the Delta Cross Channel, the Contra Costa Canal and Pumping Plants, Contra Loma Dam, Martinez Dam, the C.W. “Bill” Jones Pumping Plant

(formerly Tracy Pumping Plant), the Tracy Fish Collection Facility (TFCF), the Delta-Mendota Canal, and the Delta-Mendota Canal-California Aqueduct Intertie (DCI) Pumping Plant.

The Delta Division was authorized in the original CVP authorization of 1937 that provided for water stored behind Shasta Dam to be conveyed through the Delta to the San Joaquin River Basin. Reclamation operates the Delta Division consistent with the authorized purposes of the CVP and water rights permits and decisions by the Water Board, including conditions related to Delta water quality.

C.8.1 State Water Resources Control Board Decisions and Permits

Water Board Water Rights Decision 990 (D-990) approved permit applications for the CVP to appropriate water from the Sacramento River and the Delta, setting diversion and storage amounts for various beneficial uses including power, irrigation, incidental domestic, stock-watering and recreation. D-990 also set the season for diversion to storage from about October 1 to about June 30th and year-round for direct diversion and the place of use to include the San Joaquin Valley. In D-990, the Water Board determined not to establish any requirements to address salinity issues in the Delta. Rather, the Water Board included condition 25 that reserved jurisdiction over the issue pending completion of the SWP facilities and pending discussions among Reclamation, the State and local water users. Salinity requirements were adopted later starting with State Water Resources Control Board Water Right Decision 1485 (D-1485), followed by D-1641. Condition 28 was added making the permits subject to the Coordinated Operations Agreement between Reclamation and the DWR.

Applications 5626, 9363, and 9364, discussed in Section 9 , CVP - Shasta Division, Applications 13370 and 13371, discussed in Section 2 , CVP – American River Division, and Applications 15374, 15375, 16767,17374, and 17376, discussed in Section 10 , CVP - Trinity Division, all provide for direct diversion at the Jones Pumping Plant. A water right permit was issued for Application 9366 (Permit 12725) on April 12, 1961, authorizing direct diversion of up to 200 cfs year-round. The point of diversion is at Rock Slough. Application 9366 was authorized for irrigation and domestic purposes. The authorized place of use was as shown on Reclamation's Map No. 614-212-2.

A water right permit was issued for Application 9367 (Permit 12726) on April 12, 1961, authorizing direct diversion up to 250 cfs year-round. The point of diversion is at Rock Slough. Application 9367 was authorized for municipal and industrial purposes. The authorized place of use was as shown on Reclamation's Map No. 614-212-2. The total quantity that may be diverted pursuant to Applications 9366 and 9367 shall not exceed 350 cfs.

A water right permit was issued for Application 9368 (Permit 12727) on April 12, 1961, authorizing direct diversion up to 4,000 cfs year-round. The point of diversion is at Old River. Application 9368 was authorized for irrigation and domestic purposes. The authorized place of use was as shown on Reclamation's Map No. 214-212-62.

A permit was issued for Application 22316 (Permit 15735) on November 6, 1968, authorizing the diversion to storage of up to 5,400 acre-feet. The point of diversion is at Rock Slough for rediversion at Contra Loma Dam. Application 22316 was authorized for irrigation, domestic, municipal, industrial, and water quality control. The authorized place of use is within Contra

Costa County. The authorized place of use was for 120,000 acres in Contra Costa County as shown on Reclamation's maps on file with the Water Board.

On June 2, 1994, the Water Board, through Water Right Decision 1629 (D-1629), amended the following permitted applications for Shasta Dam, Trinity Dam, Rock Slough, Folsom Dam, New Melones Dam, Whiskeytown Dam, Black Butte Dam, and Contra Loma Dam to add a point of diversion at Old River for delivery to Los Vaqueros Reservoir and to add Contra Costa Water District to the authorized place of use: 5626, 5628, 9363, 9364, 9366, 9367, 13370, 13371, 14858, 15374, 15375, 16767, 17374, 17376, 18115, 19304, and 22316.

On August 25, 2010, the Water Board, through Water Right Order, amended the following permitted applications for Shasta Dam, Trinity Dam, Rock Slough, Folsom Dam, New Melones Dam, Whiskeytown Dam, Black Butte Dam, and Contra Loma Dam (a) to add a point of diversion at Victoria Canal and (b) to add incidental hydroelectric power generation as a purpose of use for Contra Costa Water District's Los Vaqueros Energy Recovery Project: 5626, 5628, 9363, 9364, 9366, 9367, 13370, 13371, 14858, 15374, 15375, 16767, 17374, 17376, 18115, 19304, and 22316.

C.8.2 State Water Resources Control Board Decision 1641

Under D-1641, Reclamation operates Delta Division facilities, in particular the Jones Pumping Plant, to help meet various water quality objectives in the 1995 WQCP. For example, exports from the Delta can be reduced to assist in meeting salinity objectives in the Delta, including Spring X2 requirements. Spring X2 is a Delta outflow requirement from February through June to maintain freshwater and estuarine conditions in the western Delta to protect aquatic life. The criteria require operations of the CVP and SWP upstream reservoir releases and Delta exports in a manner that maintains a salinity objective at an "X2" location. X2 refers to the horizontal distance from the Golden Gate Bridge in kilometers (km) along the axis of the Delta estuary to the point where tidally averaged near-bottom salinity concentration of 2 parts of salt in 1,000 parts of water occurs; the X2 standard was established to improve shallow water estuarine habitat in the months of February through June and relates to the extent of salinity movement into the Delta (California Department of Water Resources et al. 2013). While export reductions can assist in meeting Spring X2, upstream releases are often used to meet the objectives.

In addition, D-1641 dictates specific export limits during the year, including an export to inflow (E/I) ratio throughout the year. Exports are limited to 35% of total Delta inflow from February through June each year, and 65% from July through January each year. The 35% E/I from February to June required in D-1641 represented a significant change in Delta operations from those required under the 1978 WQCP and State Water Resources Control Board Decision 1485. This spring requirement reduced the availability of "unstored" flow for export and storage in San Luis Reservoir. February to June became an unreliable season for conveying water across the Delta.

D-1641 also consolidated the purposes of use of Applications 9366, 9367, 9368, and 22316, pertaining to the Delta Division, for irrigation, domestic, municipal, industrial, fish and wildlife enhancement, salinity control, water quality control, stock-watering, and recreation purposes, and consolidated the place of use as shown on Reclamation's Map No. 214-208-12581.

C.8.2.1 Water Supply Contracts

Water delivery contracts that are part of the Delta Division include water service/repayment contracts, settlement contracts, and exchange contracts for delivery of CVP water from the Delta- Mendota Canal and Mendota Pool. Included in the Delta Division are the Cross Valley Contracts that include conveyance of CVP water through SWP facilities. Certain water service contracts have been converted to repayment contracts pursuant to the WIIN Act. All water contracts, including those within the Delta Division, are identified in Attachment 2, and example Delta Division water contracts are included in Attachment 3.

Water Service and Repayment Contracts: These contracts provide for the delivery of CVP water to contractors that are located south of and within the Delta. CVP water is provided to these contractors for both M&I and agricultural purposes. Reclamation is shielded from any liability if there is a shortage of water due to drought or actions taken by Reclamation to meet a legal obligation.

- *DMC Unit*: Within the DMC Unit, Reclamation annually provides up to 330,100 acre-feet of CVP Water for agricultural and M&I purposes.
- *Mendota Pool Unit*: Within the Mendota Pool Unit, Reclamation annually provides up to 60,278 acre-feet of CVP water for agricultural and M&I purposes.
- *Cross Valley Canal Unit*: Within the Cross Valley Canal Unit, Reclamation annually provides up to 128,300 acre-feet of CVP water for agricultural and M&I purposes.
- *Contra Costa Canal Unit*: Within the Contra Costa Canal Unit, Reclamation annually provides up to 195,000 acre-feet of CVP water for Agricultural and M&I purposes.

***San Joaquin River Exchange Contract*:** Within the Delta Division, Reclamation administers the Second Amended Contract for Exchange of Waters, which allows the United States to use San Joaquin River water for CVP purposes, and specifically the Friant Division, so long as Reclamation provides substitute water to the Exchange Contractors. The Second Amended Exchange Contract stems from a July 27, 1939 Purchase Contract (No. I1r-1145) and Exchange Contract (Contract No. I1r-1144). It provides for the annual delivery of up to 840,000 acre-feet of Substitute Supply to four Exchange Contractors, which reflects the Schedule 1 quantities in the 1939 Purchase Contract. In a Critical Year, that amount is automatically reduced to 650,000 acre-feet. Reclamation normally provides the Substitute Supply from the Delta through the DMC, but the source of the Substitute Supply is not limited to the DMC. For a temporary reduction in the Substitute Supply, for any reason, the water to be delivered may come from the San Joaquin River.

San Joaquin River Settlement Contracts: Reclamation administers nine settlement contracts wherein Reclamation agreed to provide substitute water to senior water users in the San Joaquin River basin. These settlement contracts provide for the annual delivery of up to 35,623 acre-feet of Schedule 2 water from Mendota Pool at no charge to the contractors. That amount reflects the Schedule 2 water supplies agreed to in the 1939 Purchase Contract, discussed above, but those amounts are subject to an automatic reduction of about 25% in a Critical Year. Some of these contracts also provide for the delivery of Supplemental Water, but that water is only delivered if

Reclamation deems it available (on an annual basis) and the contractor agrees to pay and take delivery.

***Warren Act Contracts*:** Reclamation administers several Warren Act Contracts that provide for the storage and/or conveyance of non-Project Water through Excess Capacity in Reclamation facilities in the Delta. Since these contracts do not convey Project Water, Reclamation does not apply water shortage provisions to Warren Act contractors. However, any conveyance is limited to the use of Excess Capacity.

C.8.3 C.W. Jones Pumping Plant

The pumping plant was authorized by the 1937 Rivers and Harbors Act and operations of the Jones Pumping Plant is guided by, D-1641, facility limitations, and the COA, among other factors. The CVP's Jones Pumping Plant, located near Tracy, has six available pumps that moves water into the Delta-Mendota Canal. The Jones Pumping Plant has a physical capacity of approximately 5,200 cfs, but operated to a maximum capacity of 4,600 cfs.

Mean daily flows for Water Years 2001 through 2022 is presented on Figure C-27 for diversions at Jones Pumping Plant (California Department of Water Resources 2023w).

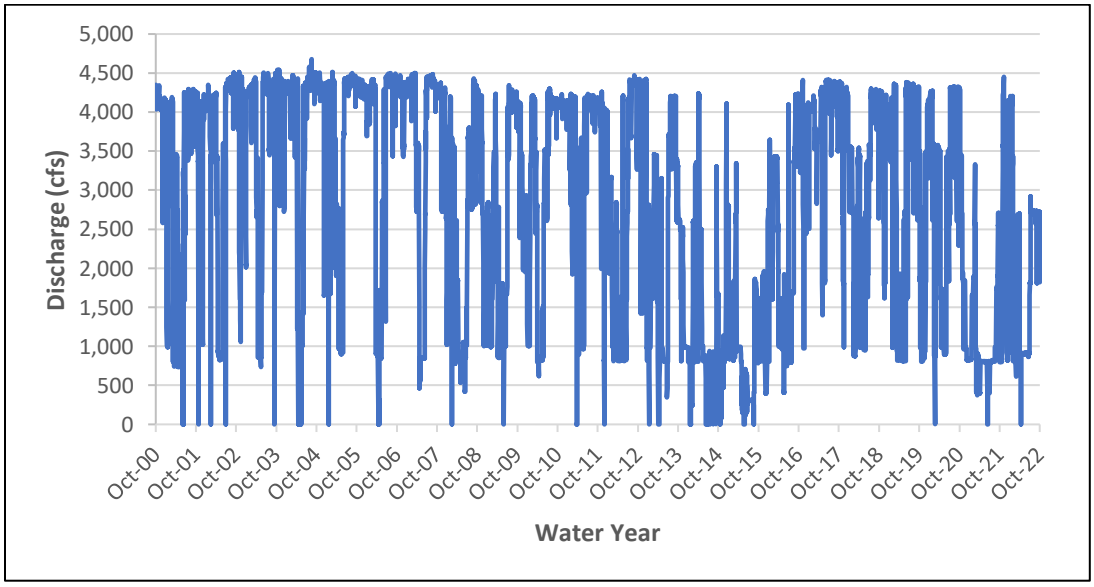

Figure -27. Jones Pumping Plant

C.8.3.1 Joint Point of Diversion

D-1641 authorized the SWP and CVP (designated CVP permits, excluding those for New Melones Dam and Friant Dam, and SWP permits) to jointly divert or redivert at the other project's pumping plant (Jones and Banks) in the southern Delta, with conditional limitations and required response coordination plans (referred to as Joint Point of Diversion [JPOD]). Use of JPOD is based on staged implementation and conditional requirements for each stage of implementation. The stages of JPOD in SWRCB D-1641 are:

- Stage 1—for CVP water service to a group of CVP water service contractors (Cross Valley Canal contractors, San Joaquin Valley National Cemetery and Musco Family Olive Company), and to recover export reductions implemented to benefit fish;
- Stage 2—for any purpose authorized under the respective CVP and SWP water right permits; and
- Stage 3—for any purpose authorized, up to the physical capacity of the respective diversion facility.

In general, JPOD capabilities are used to accomplish four basic CVP and SWP objectives:

- When wintertime excess pumping capacity becomes available during Delta excess conditions and total CVP and SWP San Luis storage is not projected to fill before the spring pulse flow period, the Project with the deficit in San Luis storage may elect to pursue the use of JPOD capabilities.
- When summertime pumping capacity is available at Banks Pumping Plant and CVP reservoir conditions can support additional releases, the CVP may elect to use JPOD capabilities to enhance annual CVP south of Delta water supplies.
- When summertime pumping capacity is available at Banks or Jones Pumping Plant to facilitate water transfers, JPOD may be used to further facilitate water transfers.
- During certain coordinated CVP and SWP operation scenarios for fishery entrainment management, JPOD may be used to shift CVP and SWP exports to the facility with the least fishery entrainment impact while minimizing export at the facility with the most fishery entrainment impact.

Each stage of JPOD has regulatory terms and conditions that must be satisfied in order to implement JPOD. All stages require a response plan to ensure water elevations in the southern Delta will not be lowered to the injury of local riparian water users (Water Level Response Plan) and a response plan to ensure the water quality in the southern and central Delta will not be significantly degraded through operations of the JPOD to the injury of water users in the southern and central Delta (Water Quality Response Plan). Stage 2 has an additional requirement to complete an operations plan that will protect fish and wildlife and other legal users of water (Fisheries Response Plan). Stage 3 has an additional requirement to protect water levels in the southern Delta as well as the requirement to complete an operations plan to protect aquatic resources and other legal users of water. Any JPOD diversion at Banks Pumping Plant that causes the Delta to change from excess to balanced conditions is junior to CCWD water right permits for the Los Vaqueros Project (Permits 20749 and 20750 of CCWD). A JPOD diversion at Banks Pumping Plant must have an X2 location during excess Delta conditions remaining west of Chipps Island and Collinsville and be consistent with the 1993 Los Vaqueros Biological Opinion for Delta smelt.

C.8.4 Tracy Fish Collection Facility

The TFCF is located on the south-west portion of the Delta at the head of the intake channel for the Jones Pumping Plant. The TFCF uses behavioral barriers consisting of primary louvers and

four rotating traveling screens aligned in a single row seven degrees to the flow of the water, to guide entrained fish into holding tanks before transport by truck to release sites at the confluence of the Delta. The TFCF was designed to handle smaller fish (<200 millimeters [mm]) that would have difficulty fighting the strong pumping plant induced flows since the intake is essentially open to the Delta, and also impacted by tidal action. Operational standards are summarized in Table II of D-1485.

The primary louvers are located on the primary channel just downstream of the trash rack structure. The louvers allow water to pass through onto the pumping plant but the openings between the slats are tight enough and angled against the flow of water to prevent most fish from passing between them and instead, enable the fish to enter one of four bypass entrances along the louver arrays. The four bypass structures direct water into a secondary channel. Traveling screens in the secondary channel have small openings and are mounted oblique to the flow of water to divert fish to one of four holding tanks where they are held pending transport to fish release sites at the confluence of the Sacramento-San Joaquin River Delta.

The TFCF was authorized pursuant to the Fish and Wildlife Coordination Act and put in operation in 1957. In 1992, pursuant to CVPIA 3406(b)(4), Reclamation was authorized and directed to develop and implement a program to mitigate for fishery impacts associated with operations of the Jones Pumping Plant. The program is to include, but is not limited to, improvement or replacement of the fish screens and fish recovery facilities and practices associated with the Jones Pumping Plant.

Salvage of fish occurs at the TFCF 24 hours per day, 365 days per year. Fish are salvaged in flow-through holding tanks (6.1-meter (m) diameter, 4.7-m deep) that provide continuous flows of water. Fish are maintained in these holding tanks for 8 to 24 hours, depending on the species of fish that are being salvaged, the number of fish salvaged, and debris load. The number of fish that are salvaged in TFCF holding tanks is generally estimated by performing a 30-minute fish-count subsample every 120 minutes (2 hours). The number of each species of fish collected in the subsample is determined and then multiplied by 4 (120 pumping minutes/30-minute fish-count subsample equals an expansion factor of 4) to estimate the total number of each species of fish, as well as the total number of fish, that were salvaged in TFCF holding tanks during the 120-minute period. Pumping minutes and fish-count minutes could potentially deviate from 120 minutes and 30 minutes, respectively, which would change the expansion factor used to estimate total fish salvage.

If no Chinook Salmon, Steelhead, or Delta Smelt are salvaged, fish can be maintained in TFCF holding tank for up to 24 hours. If a Chinook Salmon or Steelhead is collected during fish-counts, fish can only be maintained in TFCF holding tanks for up to 12 hours. If a Delta Smelt is collected during fish-count, salvaged fish may only be held in TFCF holding tanks for up to 8 hours. When fish can be maintained in TFCF holding tanks for 24 hours, fish transport (fish-haul) generally occurs at approximately 0700 each day. When two fish-hauls per day are necessary, fish hauls generally occur at 0700 and 2130 each day. When three fish-hauls are necessary, they are usually completed at 0700, 1500, and 2130 each day. Fish-haul is also dictated by the Bates Tables which uses size classes, species, and water temperature as indicators for when to conduct a fish-haul.

During normal operations, salvaged fish are transported approximately 49.9 kilometer (km and released at one of two Reclamation release sites near the confluence of the Sacramento and San Joaquin Rivers (Antioch Fish Release Site and Emmaton Fish Release Site). In general, the Emmaton Fish Release Site is used for fish-hauls performed during daytime hours and the Antioch Fish Release Site is used for fish-hauls performed during nighttime hours. This is done for safety and security reasons as the Antioch Fish Release Site has a gate that can be locked behind the operator after entering the release site area. Upon arrival at release sites, operators measure certain important water quality parameters (dissolved oxygen, salinity, and temperature) prior to releasing fish. This is done to verify that water quality parameters remain acceptable during fish transport.

C.8.5 Delta Cross Channel

The DCC is a gated diversion channel in the Sacramento River near Walnut Grove and Snodgrass Slough. When the gates are open, water flows from the Sacramento River through the cross channel to channels of the lower Mokelumne and San Joaquin Rivers toward the interior Delta. The DCC operation improves water quality in the interior Delta by improving circulation patterns of good quality water from the Sacramento River towards Delta diversion facilities. The DCC was authorized by the 1937 CVP Act and constructed in 1950 and 1951.

Reclamation operates the DCC in the open position to (1) improve the movement of water from the Sacramento River to the export facilities at the Banks and Jones Pumping Plants, (2) improve water quality in the southern Delta, and (3) reduce salt water intrusion rates in the western Delta. During the late fall, winter, and spring, the gates are often periodically closed to protect out migrating salmonids from entering the interior Delta. In addition, whenever flows in the Sacramento River at Sacramento reach 20,000 to 25,000 cfs (on a sustained basis) the gates are closed to reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates.

Flow rates through the gates are determined by Sacramento River stage and are not affected by export rates in the south Delta. D-1641 requires closure of the DCC gates for fisheries protection as follows.

- From November 1 through January 1, the DCC may be closed for up to 45 days for fishery protection purposes.
- From February 1 through May 20, the gates are closed for fishery protection purposes.
- The gates may also be closed for 14 days for fishery protection purposes during the May 21 through June 15 period.

The DCC also serves as a link between the Mokelumne River and the Sacramento River for small crafts and is used extensively by recreational boaters and fishermen whenever it is open. From mid-June to November, Reclamation usually keeps the gates open on a continuous basis. The DCC is also usually opened for the busy recreational Memorial Day weekend, if this is possible from a fishery, water quality, and flow standpoint.

C.8.6 Delta-Mendota Canal

The Delta-Mendota Canal, the second largest of the CVP waterways, was completed in 1951. It includes both concrete-lined and earth-lined sections and is about 117 miles in length. It carries water southeasterly from the Jones Pumping Plant along the west side of the San Joaquin Valley to be used as irrigation, municipal, industrial, and refuge supply in the Delta Division, San Felipe Division, and West San Joaquin Divisions.

The terminus of the canal is at Mendota Pool, which is controlled by a concrete storage dam constructed in 1919. The Mendota Pool is located at the confluence of the San Joaquin River and the north fork of the Kings River, approximately 30 miles west of Fresno. The Mendota Pool is a non-federal facility. The Central California Irrigation District (CCID) owns and operates Mendota Dam and Lan Luis & Delta Mendota Water Authority operates the Mendota Pool.

C.8.7 Delta-Mendota Canal - California Aqueduct Intertie Pumping Plant

The DMC-California Aqueduct Intertie (DCI) between the DMC and the California Aqueduct allows water to flow in both directions between the CVP and SWP conveyance facilities. The DMC-California Aqueduct Intertie achieves multiple benefits, including meeting current water supply demands, allowing for the maintenance and repair of the CVP Delta export and conveyance facilities, and providing operational flexibility to respond to emergencies.

The Intertie was authorized by Public Law 108-361, section 103(d)(2)(c)(i), providing for the evaluation and construction of an intertie between the State Water Project California Aqueduct and the Central Valley Project Delta Mendota Canal, near the City of Tracy, as an operation and maintenance activity, except that the Secretary shall design and construct the intertie in a manner consistent with a possible future expansion of the intertie capacity. In 2011, DWR and Reclamation executed an agreement for the use of the DMC-CA Intertie.

The DMC-California Aqueduct Intertie allows for the following:

- up to 697 cfs of pumping from the DMC to the California Aqueduct;
- up to 900 cfs of conveyance from the California Aqueduct to the DMC using gravity flow.

C.8.8 Contra Costa Facilities- Rock Slough Intake and Canal

Contra Costa Water District (CCWD) diverts water from the Delta for irrigation and M&I uses under its CVP contract, under its own water right permits and license issued by the Water Board, and under East Contra Costa Irrigation District's pre-1914 water right. CCWD's water system includes the Mallard Slough, Rock Slough, Old River, and Middle River (on Victoria Canal) intakes; the Contra Costa Canal and shortcut pipeline; and the Los Vaqueros Reservoir; and related conveyance facilities. The Rock Slough Intake facilities, the Contra Costa Canal, and the shortcut pipeline are owned by the United States and operated and maintained by CCWD under contract with Reclamation. These Reclamation facilities were authorized by the 1937 CVP Act. Reclamation completed construction of a fish screen at the Rock Slough Intake in 2011. Federal legislation providing the authority for Reclamation to transfer title to the Contra Costa Canal and Rock Slough Fish Screen facilities was passed by Congress and signed by the President in March

2019. CCWD and Reclamation are in the title transfer process, which includes conducting the required environmental and property record reviews to execute the transfer.

The Rock Slough Intake is located about four miles southeast of Oakley. The fish screen at this intake was constructed to comply with the requirements of the CVPIA and the Biological Opinions from U.S. Fish and Wildlife Service (USFWS) (2017 amendment to 2005 O&M Biological Opinion) and National Marine Fisheries Service (NMFS) (2017 NMFS with 2018 errata) for the Los Vaqueros Project to reduce take of fish through entrainment at the Rock Slough Intake.

The Contra Costa Canal is 48 miles long. CCWD's Contra Costa Canal Replacement Project replaces the 4-mile long, earth-lined portion of the Contra Costa Canal between the Rock Slough Fish Screen and Pumping Plant #1 with a buried 10'-diameter concrete pipe. The remaining 44 miles of the Contra Costa Canal after Pumping Plant #1 are concrete-lined. The earth-lined portion of the Contra Costa Canal is subject to water quality degradation due to seepage into the canal from saline groundwater in the area, as well as seepage losses where the groundwater table is lower than canal water levels. Replacing the open channel with a buried pipe also eliminates evaporative losses. Removal of the open water facility also improves public safety, system security, and flood control, which are needed in light of the developing and planned urbanization in the vicinity. As of late 2024, approximately 3.9 miles of the earth-lined portion of the Canal has been replaced (from Pumping Plant #1 to the east) and the flood isolation structure near the fish screen has also been completed. Pumping Plant #1 has a permitted capacity to pump up to 350 cfs into the Canal.

Water is pumped west from Rock Slough through a positive barrier fish screen into the Contra Costa Canal using Pumping Plants #1 through #4. Diversions at Rock Slough Intake are typically taken under CVP contract or under East Contra Costa Irrigation District's pre-1914 water right. CCWD diverts approximately 30 percent to 50 percent of its total annual supply through the Rock Slough Intake, depending upon water quality in a given year.

C.9 Central Valley Project–West San Joaquin Division

The West San Joaquin Division currently includes only the San Luis Unit.

C.9.1 San Luis Unit

The San Luis Unit facilities are operated for flood control, storage, and the direct delivery of water and delivery of stored water for irrigation and M&I uses, power generation, recreation and mitigation, protection and restoration of fish and wildlife resources. The San Luis Unit was authorized by the Act of June 3, 1960. "The principal engineering features of said unit shall be a dam and reservoir at or near the San Luis site, a forebay and afterbay, the San Luis Canal, the Pleasant Valley Canal, and necessary pumping plants, distribution systems, drains, channels, levees, flood works, and related facilities."

The San Luis Unit consists of the following:

- O'Neill Forebay (joint CVP and SWP facility)
- San Luis Reservoir (joint CVP and SWP facility)
- B.F. Sisk Dam (joint CVP and SWP facility)
- O'Neill Pumping-Generating Plant (CVP facility)
- William R. Gianelli Pumping-Generating Plant (joint CVP and SWP facility-operated by DWR)
- San Luis Canal (joint CVP and SWP facility co-named California Aqueduct, (operated by DWR)
- Dos Amigos Pumping Plant (joint CVP and SWP facility operated by DWR)
- Coalinga Canal (CVP facility)
- Pleasant Valley Pumping Plant (CVP facility)
- Los Banos and Little Panoche Detention Dams and Reservoirs (joint CVP and SWP facilities).

The above "joint" facilities are also referred to as the "San Luis Joint-Use Complex". The United States owns the above San Luis Unit facilities.

Under Contract No. 8-07-20-X0354-X, dated January 14, 2020, for a period up to 35-years, subject to renewal, the San Luis & Delta-Mendota Water Authority is responsible for the operation, maintenance, and replacement of C.W. 'Bill' Jones Pumping Plant, Delta-Mendota Canal, Delta-Mendota Canal Intertie, and other Project Works listed on Exhibit A of that Contract.

C.9.1.1 State Water Resources Control Board Decisions 1020 and 1250

Water rights permits were issued in 1961 and 1966 for the San Luis Unit, including diversion from Old River through the Jones Pumping Plant for storage in San Luis Reservoir and the expansion of the CVP place of use to include lands on the west side of the San Joaquin Valley. Application 15764 was originally filed by Westlands Water District and later assigned to Reclamation. Decision 1020 approved a permit for Application 15764 as well as the addition of San Luis Dam, Mendota Dam, and Arroyo Canal as points of rediversion. In 1966, Decision 1250 approved Reclamation's Application 21542 to authorize power generation at San Luis Reservoir.

Application 15764 (Permit 12860) was approved on August 4, 1961, by Decision 1020, authorizing up to 1,000,000 acre-feet for off-stream storage from about November 1 to about April 30 of the following year. The maximum rate of diversion shall not exceed 4,200 cfs. The maximum rate of diversion through the Delta-Mendota Canal, together with Reclamation's other rights, shall not exceed 4,600 cfs. The point of diversion is Old River. Application 15764 was authorized for irrigation, incidental domestic, municipal, industrial, stock-watering, and recreation purposes. D-1641 consolidated the purposes of use of Application 15764 for irrigation, domestic, municipal, industrial, fish and wildlife enhancement, salinity control, water

quality control, stock-watering, and recreation purposes, and consolidated the place of use as shown on Reclamation's Map No. 214-208-12581.

Application 21542 (Permit 15149) as approved on August 12, 1966, by Decision 1250, authorizing up to 1,000,000 acre-feet for off-stream storage from about November 1 to about April 30 of the following year. The maximum rate of diversion shall not exceed 4,200 cfs. The maximum rate of diversion through the Delta-Mendota Canal, together with Reclamation's other rights, shall not exceed 4,600 cfs. The point of diversion is at Old River. Application 21542 was authorized for power generation at the San Luis Pumping-Generation Plant.

A water right license was issued on Application 21009 (License 12134) on March 2, 1987, authorizing the diversion to storage of up to 14,000 acre-feet from November 1 to April 30 of the following year. The point of diversion is at Los Banos Creek Detention Dam. License 12134 was authorized for recreation and fish and wildlife preservation and enhancement purposes at Los Banos Creek Detention Reservoir as well as for incidental domestic use in the park area around the reservoir.

C.9.1.2 Water Supply Contracts

Within the West San Joaquin Division, Reclamation provides water to the DMC and San Luis Unit primarily to meet demands from three types of contractors: CVP water service contractors (including both agricultural and M&I), senior water rights contractors, including the San Joaquin River Exchange and Settlement Contractors, and wildlife refuge contractors. The San Joaquin River Exchange and Settlement Contracts are discussed in Section 3 – Delta Division.

Water Service and Repayment Contracts: Within the San Luis Unit, Reclamation annually provides for the delivery of up to 1,395,670 acre-feet of CVP water from the Delta. There are eight water service contracts in the San Luis Unit, the largest in terms of water quantity and land area being Westlands Water District. All but one of those have been converted to repayment contracts pursuant to the WIIN Act.

Refuge Contracts: Reclamation administers three contracts that provide for the delivery of CVP water to wildlife refuges and wildlife areas located South of the Delta. Under these contracts, Reclamation annually delivers of up to 271,000 acre-feet of Level 2 water and up to 105,514 af of Level 4 water for wildlife purposes. In accordance with Section 3406(d)(4) of CVPIA, Level 2 supplies may be temporarily reduced up to 25% whenever reductions due to hydrologic circumstances are imposed upon agricultural deliveries of CVP water. For a more complete description of the CVPIA Refuge Water Supply Program and these contracts, please see Section 11, *Central Valley Project Improvement Act*.

C.9.2 B. F. Sisk (San Luis) Dam and San Luis Reservoir

The San Luis Reservoir, formed by B.F. Sisk Dam and operated and maintained by DWR, can store approximately 2.028-MAF of water, of which approximately 0.966 MAF is the CVP's share and 1.062 MAF is the SWP's share. Water generally is diverted into San Luis Reservoir during late fall through early spring when irrigation water demands of CVP and SWP water users are low and are being met by Delta exports.

Water storage volumes and water storage elevations for San Luis Reservoir for Water Years 2001 through 2022 are presented on Figures C-28 and C-29 (California Department of Water Resources 2023x, 2023y).

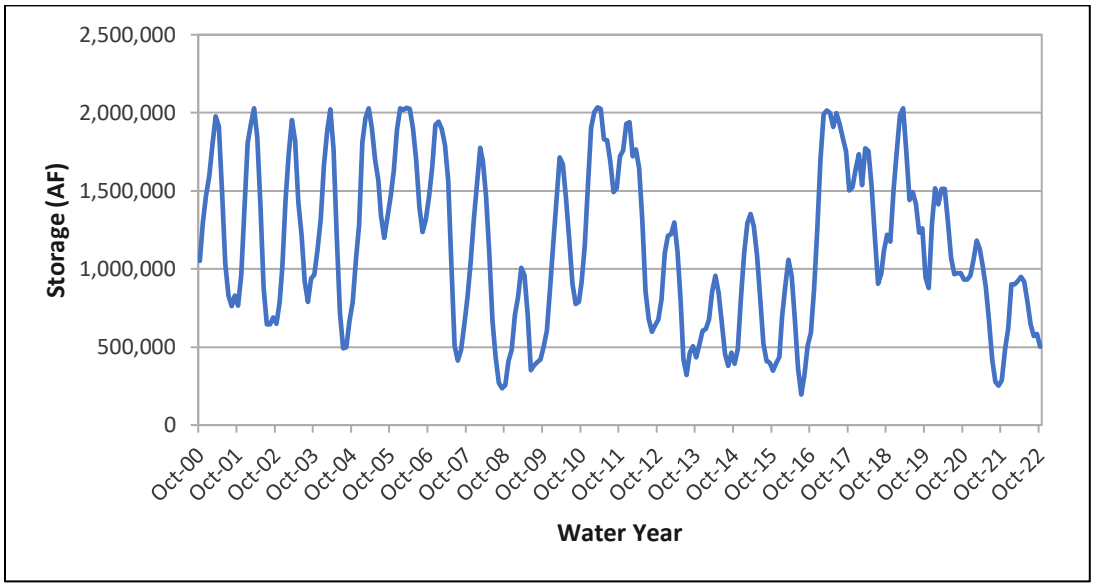

Figure C-28. San Luis Reservoir Storage

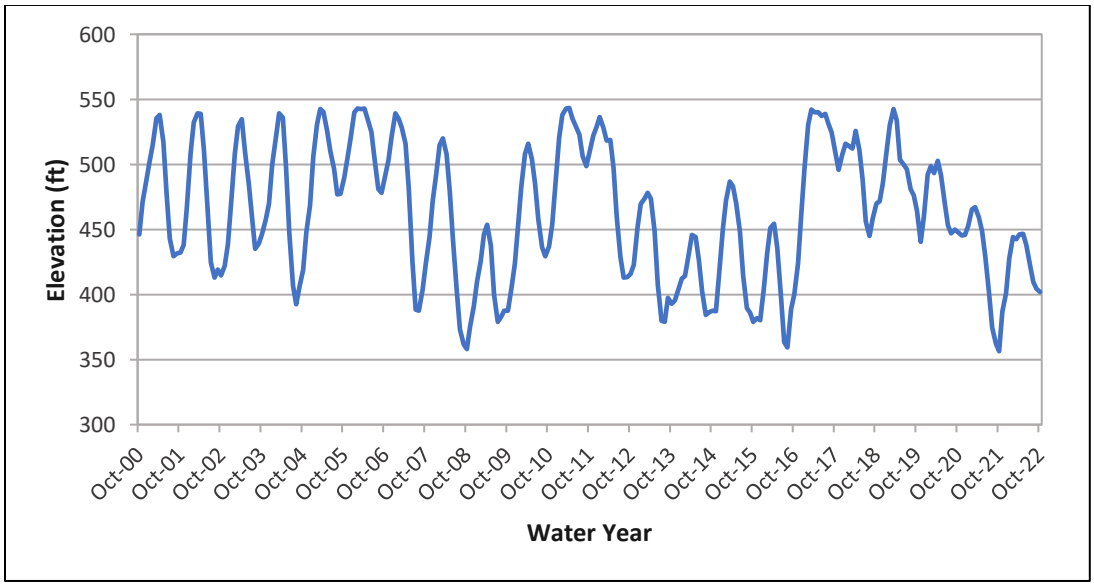

Figure C-29. San Luis Reservoir Elevation

Completed in 1967, B. F. Sisk Dam is located on San Luis Creek near the City of Los Banos. The earthen-filled dam is 382 feet high with a crest length of 18,600 feet. The dam's crest is 30 feet thick and the maximum base width is 2,420 feet.

The off- stream reservoir acts as a major storage reservoir for surplus Delta flows. A hydraulic junction point for both federal and state waters, the reservoir receives and discharges water from

the William R. Gianelli Pumping- Generating Plant situated at the toe of the dam and on the western shore of the O'Neill Forebay.

The CVP diverts water from San Luis Reservoir via the Pacheco Pumping Plant on the western shore of the San Luis Reservoir through the Pacheco Tunnel and Pacheco Conduit, conveying water to CVP water service contractors in Santa Clara and San Benito counties.

C.9.3 O'Neill Forebay (joint Central Valley Project and State Water Project facility)

O'Neill Dam and Forebay are located on San Luis Creek, 2.5 miles downstream from B. F. Sisk Dam. Completed in 1967, the dam is a zoned earthfill structure with a height of 87 feet and a crest length of 14,300 feet. The forebay has a capacity of approximately 56,400 acre-feet, of which the top 20,000 acre-feet of the forebay act as a re-regulator of storage necessary to permit off-peak pumping and on-peak generation by the William R. Gianelli Pumping-Generating Plant.

Supplied by Banks Pumping Plant and the SWP, the California Aqueduct discharges directly into O'Neill from the north. To the south the forebay discharges into the joint use facility of the San Luis Canal as controlled by Check 13 and the Dos Amigos Pumping Plant. The 2,200-foot-long O'Neill Forebay Inlet Channel conveys water from the Delta Mendota Canal to the O'Neill Forebay through the O'Neill Pumping-Generating Plant. The forebay is used as a hydraulic junction point for federal and state waters.

C.9.4 O'Neill Pumping-Generating Plant

The O'Neill Pumping-Generating Plant consists of an intake channel leading off the Delta-Mendota Canal and six pumping-generating units. These units operate as pumps to lift water from 45 to 53 feet into the O'Neill Forebay. When water is released from the forebay to the Delta-Mendota Canal, these units operate as generators. When operating as pumps and motors, each unit can discharge 700 cfs and has a rating of 6,000 horsepower. When operating as turbines and generators, each unit has a generating capacity of about 4,200 kilowatts.

C.9.5 William R. Gianelli Pumping-Generating Plant (joint Central Valley Project and State Water Project facility)

The William R. Gianelli Pumping-Generating Plant (GPGP), located at the toe of San Luis Dam, operates as both a pumping station and a generating plant. The plant lifts water by pump-turbines from O'Neill Forebay into San Luis Reservoir. During the irrigation season, water is released from San Luis Reservoir through the pump-turbines to the forebay, and energy is reclaimed. Each of the eight pumping-generating units uses 63,000 horsepower at 1,375 cfs when pumping or will develop 53,000 kilowatts at 1,640 cfs when generating. DWR and Reclamation generally pump water through GPGP into San Luis Reservoir during late fall through early spring for temporary storage until water is released to meet late-spring and summer peaking demands of SWP and CVP contractors.

The Dos Amigos Pumping Plant (joint CVP and SWP facility) is located 17 miles south of O'Neill Forebay and is a relift plant in the San Luis Canal. The plant contains six pumping units, each capable of delivering 2,200 cfs of water.

C.9.6 Pleasant Valley Pumping Plant

The Pleasant Valley Pumping Plant pumps water into the Coalinga Canal. The Westlands Water District operates and maintains this pumping plant. This facility lifts water 180 feet from an intake channel leading from the San Luis Canal at mile 74. Nine units are used to deliver 1,135 cfs of water into the Coalinga Canal and 50 cfs of water to a distribution lateral serving adjacent lands north of the pumping plant.

C.9.7 Coalinga Canal

Formerly called the Pleasant Valley Canal, the Coalinga Canal carries water from the turnout structure on the San Luis Canal to the Coalinga area in Fresno County. The system includes a 1.6-mile intake channel to the Pleasant Valley Pumping Plant and 11.6 miles of canal. The initial capacity of the canal is 1,100 cfs, decreasing to 425 cfs at the terminus. The Westlands Water District operates sections of the Coalinga Canal. The City of Coalinga is served from this facility.

C.9.8 Los Banos and Little Panoche Detention Dams and Reservoirs

The Los Banos and Little Panoche Detention Dams are located southwest of the city of Los Banos on Los Banos and Little Panoche Creeks. Both are zoned earthfill detention dams. These dams are required to protect the San Luis Canal by controlling flows of streams crossing the canal. The Little Panoche Dam acts as a sediment trap and prevents flooding of the San Luis Canal and downstream lands. The Los Banos Detention Dam also protects the DMC, as well as the City of Los Banos and adjacent areas, from damaging floods.

C.9.9 San Luis Canal

The San Luis Canal is a joint-use facility constructed by Reclamation and operated and maintained by DWR. The concrete-lined canal has a conveyance capacity ranging from 8,350 to 13,100 cfs and is the biggest earth-moving project in Reclamation history. The San Luis Canal is the federally-built and DWR operated section of the California Aqueduct. It extends 102.5 miles from O'Neill Forebay in a southeasterly direction to its terminus at Kettleman City.

C.9.10 San Luis Drain and Kesterson Reservoir

The San Luis Drain was designed and partially constructed as a means of disposing subsurface irrigation return flows from the San Luis Unit service area. The drain was designed to collect subsurface drainage from the San Luis Unit service area and transport the water for disposal in the west Delta. Construction began in April 1968; however, the project was never completed as originally planned. Of the planned length of 188 miles, only 85 miles were ever completed. The concrete-lined canal ran from the town of Five Points in Fresno County to the former Kesterson Reservoir.

The first stage of Kesterson Reservoir was constructed as a series of 12 shallow ponds outside the town of Gustine in Merced County. The reservoir was designed to be a regulating reservoir, but for several years, water was ponded, regulated, and allowed to evaporate, pending the approval and construction of an outlet for the San Luis Drain. The reservoir was closed in 1985.

C.10 Central Valley Project Improvement Act

In 1992, the 102nd Congress passed the multi-purpose water legislation known as the CVPIA. Officially known as Title XXXIV of Public Law 102-575, this legislation amends previous authorizations of the California Central Valley Project. The purpose of the CVPIA is expressed in six broad statements found in Section 3402 of the Act:

- To protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California
- To address impacts of the CVP on fish, wildlife, and associated habitats
- To improve the operational flexibility of the Central Valley Project
- To increase water-related benefits provided by the CVP to the State of California (State) through expanded use of voluntary water transfers and improved water conservation
- To contribute to the State's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
- To achieve a reasonable balance among competing demands for use of CVP water, including the requirements of fish and wildlife, agricultural, municipal and industrial, and power contractors

The CVPIA operates in a complex environment and coordinates with actions to: operate the State and Federal water projects, comply with the State's Water Quality Control Plan, implement Biological Opinions, support Endangered Species Recovery Programs, continue water resources development, and further local projects, among other initiatives. The implementing agencies (Reclamation and USFWS) partner with entities that have the authority, interest, ability, expertise, and resources to implement CVPIA restoration actions using a variety of instruments such as interagency agreements, memoranda of understanding, grants, cooperative agreements, and contracts.

C.10.1 Contract Renewals, 3404

Section 3404 of CVPIA addressed Reclamation's ability to execute new and renewed water supply contracts. Section 3404(a) prohibited the Secretary from entering "into any new short-term, temporary, or long-term contracts or agreements for water supply from the [CVP] for any purpose other than fish and wildlife" until certain conditions are met. Section 3404(b) excepted certain short-term and long-term contracts from the restrictions of Section 3404(a) and allowed the Secretary to execute those specific contracts. Section 3404(c) provides that "the Secretary shall, upon request, renew any existing long-term repayment or water service contract for the delivery of water from the [CVP] for a period of 25 years and may renew such contracts for successive periods of up to 25 years each." Section 3404(c) imposed specific requirements on any such renewals.

C.10.2 Water Transfers, 3405(a)

Prior to the CVPIA, the ability for CVP water contractors to transfer water supplies was limited, depending upon the individual contracts. Section 3405(a) states that "all individuals or districts who receive [CVP] water under water service or repayment contracts, water rights settlement contracts or exchange contracts … are authorized to transfer all or a portion of the water subject to such contract to any other California water user or water agency, State or Federal agency, Indian Tribe, or private non-profit organization . . . ." Any such transfer is subject to the review and approval of the Secretary and subject to the conditions set forth in Section 3404(a). Section 3405(a)(1)(M) created the Accelerated Water Transfer Program for transfers between CVP contractors within counties, watersheds, or other areas of origin.

C.10.3 Anadromous Fisheries Program, 3406(b)(1)

Section 3406(b)(1) directs the Secretary to "implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991…." The target established by this section of CVPIA, known as the "fish-doubling goal," pertains to Chinook salmon, rainbow trout (steelhead), American shad, white sturgeon, green sturgeon, and other anadromous species believed to have been impacted by CVP construction and operation.

C.10.4 Dedicated Yield, 3406(b)(2)

Section 3406(b)(2) of CVPIA directs the Secretary to "dedicate and manage annually 800,000 [acre-feet] of [CVP] yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help meet such obligations as may be legally imposed upon the [CVP] under state or federal law following the date of enactment of this title, including but not limited to additional obligations under the federal Endangered Species Act." The 800,000 acre-feet of CVP yield may be reduced by up to 25% "whenever reductions due to hydrologic circumstances are imposed upon agricultural deliveries of CVP water." CVPIA 3406(b)(2)(D); *see also* Interior, Decision on Implementation of Section 3406(b)(2) of CVPIA, at 10 (May 9, 2003).

Under section 3406(b)(2), Reclamation may initiate an export reduction at the Jones Pumping Plant or upstream release from a CVP dam for "the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures" of Section 3406(b). Additionally, any export reduction or release from a CVP dam made to assist in meeting water quality objectives or obligations imposed under the ESA that "predominantly contributes" to the primary purpose of Section 3406(b) must count against the up to 800,000 acre-feet of CVP yield dedicated under Section 3406(b)(2). *San Luis & Delta-Mendota Water Authority v. United States*, 672 F.3d 676 (9th Cir. 2012) (accepting the District Court's "predominantly contributes" test). Throughout each year, Reclamation meets with USFWS and NMFS to determine what actions to take (CVP releases and export reductions) under Section 3406(b)(2), given the dedicated water supply under (b)(2) and fishery needs.

C.10.5 Refuge Water Supply Program, 3406(d)

The Refuge Water Supply Program (RWSP) includes all provisions under section 3406(d) of the CVPIA to provide firm water supplies of suitable quality to maintain and improve wetland habitat areas on units of the National Wildlife Refuge System in the Central Valley of California; on the Gray Lodge, Los Banos, Volta, North Grasslands, and Mendota state wildlife management areas; and on the Grassland Resources Conservation District in the Central Valley of California.

The Act specifies two water delivery responsibilities. Section 3406(d)(1) provides that the quantity and delivery schedules of water measured at the boundaries of each wetland habitat area shall be in accordance with Level 2 (L2) of the `Dependable Water Supply Needs' table for those habitat areas set forth in the Report on Refuge Water Supply Investigations, Chapter 5 (Bureau of Reclamation 1989) and two-thirds of the water supply needed for full habitat development for those habitat areas identified in the San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan Report (Bureau of Reclamation et al. 1989). Section 3406(d)(2) provides that the quantity and delivery schedules of water measured at the boundaries of each wetland habitat area shall be in accordance with Incremental Level 4 (IL4) of the `Dependable Water Supply Needs' table for those habitat areas set forth in the Refuge Water Supply Report and the full water supply needed for full habitat development for those habitat areas identified in the San Joaquin Basin Action Plan/Kesterson Mitigation Action Plan Report, to be acquired through voluntary measures. A full Level 4 water supply (L2 plus IL4) provides for optimum habitat management to support the enhancement of a broad range of species including targeted threatened and endangered species.

North of Delta Refuge Conveyance Contracts/Memorandum of Understanding:
Reclamation executed one contract in January 2001 with CDFW for annual water supply deliveries of up to 35,400 acre-feet of L2 water and 8,600 acre-feet of IL4 water for the Gray Lodge Wildlife Area. Reclamation also executed a MOU with the USFWS for annual water supply deliveries of up to 115,850 acre-feet of L2 water and 19,150 acre-feet of IL4 water to four National Wildlife Refuges (Sacramento National Wildlife Refuge, Delevan National Wildlife Refuge, Colusa National Wildlife Refuge, and Sutter National Wildlife Refuge).

South of Delta Conveyance Contracts/Memorandum of Understanding: Reclamation executed one contract in January 2001 with CDFW for annual water supply deliveries of up to 70.911 acre-feet of L2 water and 20,209 acre-feet of IL4 water to four State Wildlife Areas (Los Banos, Bolta, North Grasslands, and Mendota Wildlife Areas). Reclamation also executed a MOU in January 2001 with the USFWS for annual water supplies up to 75,090 acre-feet of L2 water and 30,205 acre-feet of IL4 water to Units of the National Wildlife Refuge System in the San Joaquin Valley and the National Wildlife Refuges in the Tulare Lake Basin of California (San Luis Unit, Kesterson, West Bear Creek, Freitas, Merced, East Bear Creek, Kern and Pixley). Additionally, Reclamation executed one contract in January 2001 with Grasslands Water District for annual water supply deliveries of up to 125,000 acre-feet of L2 water and 55,000 acre-feet of IL4 water to the Grassland Resource Conservation District.

C.11 Bay-Delta Water Quality Control Plan

In 1978, the Water Board adopted the 1978 Bay-Delta Water Quality Control Plan and issued Decision 148. Together, the 1978 WQCP and D-1485 revised existing standards for flow and salinity in the Delta's channels and ordered Reclamation and DWR to meet these standards by either reducing pumping, or releasing water stored in upstream reservoirs, or both. On May 22, 1995, the Water Board adopted the 1995 WQCP, which became the basis of Water Board D-1641. The Water Board amended the WQCP in 2006, but to date, the Water Board has made no significant change to the 1995 WQCP framework. The WQCP includes objectives to protect M&I uses (State Water Resources Control Board 2018, Table C-1), Agricultural Uses (State Water Resources Control Board 2018, Table C-2), and Fish and Wildlife Uses (State Water Resources Control Board 2018, Table C-3), and those objectives vary throughout the year and by the wetness of the year.

In 1999, the Water Board issued D-1641 (Implementing Flow Objectives for the Bay-Delta Estuary [and other purposes]), which amended the water right license and permits for the SWP and CVP to require the Projects to meet certain objectives in the 1995 WQCP. The Water Board issued Revised D-1641 in 2000. D-1641 amended certain terms and conditions of the SWP and CVP water rights to include flow and water quality objectives for the protection of beneficial uses in the Delta and Suisun Marsh. D-1641 provides that the CVP and SWP are to meet all the flow dependent numeric objectives of the 1995 WQCP, on an interim basis, that are not assigned to other parties. These objectives are set out in Table C-1 (M&I), Table C-2 (Agricultural) and Table C-3 (Fish and Wildlife) of the Order to D-1641. These objectives include specific Delta outflow requirements throughout the year, specific export limits in the spring, and export limits based on a percentage of estuary inflow throughout the year. The water quality objectives are intended to protect agricultural, municipal and industrial, and fishery uses, and vary throughout the year and by water year type.

Generally, many of the objectives imposed on the Projects by D-1641 can be met through upstream releases, Delta export reductions, or a mix of both. Reclamation can increase releases from CVP reservoirs, including Shasta and Folsom, to help meet water quality requirements in the Delta. Many factors are considered when deciding how much to release and which reservoirs to release from, including current storage volumes, current release rates, temperature control objectives, cold water pool volumes in all reservoirs, COA account balancing, anticipated future demands, and hydrology. When Reclamation must increase upstream reservoir releases to meet Delta requirements, Folsom Reservoir often releases water first because the released water reaches the Delta (in about one day) before flows released from other CVP and SWP reservoirs would arrive. Lake Oroville water releases require about three days to reach the Delta, while water released from Shasta Lake requires approximately five days to travel from Keswick Reservoir to the Delta. As water from the other reservoirs arrives in the Delta, Folsom Lake releases can be adjusted downward. Releases from Shasta and Folsom Lakes are coordinated with releases from Oroville for the SWP’s contribution to meeting Delta objectives. Certain other objectives in D-1641 can only be met through export reductions at the Delta pumps. Those objectives include E/I ratios that apply to exports throughout the year, but are more restrictive from February through June.

The effect of D-1641 was an increase in releases from upstream dams for WQCP objectives, including the Spring X2 requirement (see Delta Division). The more restrictive E/I ratios from February through June reduced the availability of "unstored" flow to be exported and stored in San Luis Reservoir. As a result, February to June became an unreliable season for conveying water across the Delta. This resulted in a shift in the export season to the summer, resulting in the CVP and SWP entering the fall with lower reservoir levels and less need for flood releases in the fall and winter. In 2018, the COA was updated by adding Article 10(i) from the 2018 COA Addendum to address how D-1641 operational requirements change the sharing agreement and export restrictions.

C.12 Coordinated Operation Agreement

Under the COA, Reclamation and DWR coordinate operation of the CVP and SWP to meet Sacramento Valley in-basin uses, which include water quality objectives within the Delta and other legal uses of water in the Sacramento Basin. By the Act of October 27, 1986 (P.L. 99-546), Congress authorized and directed the Secretary to execute and implement the COA for the coordination of CVP and SWP operations. The following month, in November 1986, the United States and the State of California entered into the COA (Contract No. 7-07-20-W0551), which suspended a 1960 agreement and superseded annual coordination agreements that had been implemented following construction of the SWP. In 1992, through Section 3411(b) of CVPIA, Congress directed the Secretary to "fully comply" with the United States' obligations under the COA.

In December 2018, Reclamation and DWR agreed on an addendum to the COA. The agencies amended or added five key elements of the COA to reflect the evolved manner in which the Projects have been operated since the COA was originally authorized and signed: Article 6(c), in-basin uses; Article 10(b), CVP use of Harvey O. Banks Pumping Plant; new Article 10(i), export restrictions; and Article 14(a) and new Article 14(c), periodic review. Key provisions are summarized below.

C.12.1 Accounting and Coordination of Operations

Under the COA, Reclamation and DWR coordinate on a daily basis to determine target Delta outflow for water quality, reservoir release levels necessary to meet in-basin demands, schedules for joint use of the San Luis Unit facilities, and for the use of each other's facilities for pumping and wheeling. During balanced water conditions (see below), daily water accounting is maintained for the CVP and SWP obligations. This accounting allows for flexibility in operations and avoids the necessity of daily changes in reservoir releases that originate several days' travel time from the Delta.

The COA provides the mechanism for determining the responsibility of each project for Delta outflow influenced standards; however, real-time operations dictate actions. For example, conditions in the Delta can change rapidly. Weather conditions combined with tidal action can quickly affect Delta salinity conditions, and therefore, the Delta outflow required to maintain standards. To meet outflow influenced standards, the Projects can make reservoir releases from upstream dams or adjust the level of exports from the Delta. Increasing or decreasing Project

exports can immediately achieve changes to Delta outflow, whereas upstream releases depend on travel times from the dam making the release to the Delta. Changes in reservoir releases and imbalances in meeting the CVP and SWP initial shared obligations are captured by the COA.

C.12.2 Article 6(c) - In-Basin Uses

Under the COA, in-basin uses are defined as legal uses of water in the Sacramento Basin, including the water required under the provisions of Exhibit A of the COA. Balanced water conditions are defined in the COA as periods when it is mutually agreed that releases from upstream reservoirs plus unregulated flows approximately equal the water supply needed to meet Sacramento Valley in-basin uses, plus exports. Excess water conditions are periods when it is mutually agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses, plus exports.

During excess water conditions, sufficient water is available to meet all beneficial needs, and the CVP and SWP are not required to make additional releases. In excess water conditions, water accounting is not required and some of the excess water is available to CVP water contractors, SWP water contractors, and users located upstream of the Delta. However, during balanced water conditions, the CVP and SWP share the responsibility in meeting in-basin uses.

Article 6(c) of the COA sets forth how the parties share in the responsibility to meet in-basin uses during balanced conditions with storage withdrawals. Under Article 3(d), the United States storage withdrawal includes withdrawals from Whiskeytown, Shasta and Folsom. Article 6(c), as amended, establishes that each party's responsibility for making available storage withdrawals to meet Sacramento Valley in-basin use of storage withdrawals shall be determined by multiplying the total Sacramento Valley in-basin use of storage withdrawals by the following percentages:

- Wet Years: United States 80%; California 20%
- Above Normal Years: United States 80%; California 20%
- Below Normal Years: United States 75%; California 25%
- Dry Years: United States 65%; California 35%
- Critical Years: United States 60%; California 40%.

The water year classifications described in the amended Article 6(c) is based on the Sacramento Valley 40-30-30 Index as most recently published through the DWR's Bulletin 120.

C.12.3 Article 6(g) - Duty to Export and Store During Excess Conditions

Article 6(g) of the COA states, "[d]uring excess water conditions each party has the responsibility to export and store as much water as possible within its physical and contractual limits." In *San Luis & Delta-Mendota Water Auth. v. United States DOI*, 2015 U.S. Dist. LEXIS 24970 (E.D. Cal. 2015), the District Court held that, under Section 3411 of CVPIA and Article 6(g) of the COA, Reclamation cannot voluntarily reduce exports for CVPIA 3406(b)(2) purposes during excess water conditions.

C.12.4 Article 10(b) - Central Valley Project Use of Banks Pumping Plant

Article 10(b) of the COA addendum governs CVP use of the Banks Pumping Plant during certain times. That article provides:

(b) The State will transport up to 195,000 acre-feet of Central Valley Project water through the California Aqueduct Reaches 1, 2A, and 2B no later than November 30 of each year by direct diversion or by rediversion of stored Central Valley Project water at times those diversions do not adversely affect the State Water Project purposes or do not conflict with State Water Project contract provisions. If the diversion capacity at the south Delta intake to Clifton Court Forebay is in excess of 7,180 cubic feet per second during the [sic] July 1 through September 30, the State will provide available capacity at the Banks Pumping Plant to the Central Valley Project to divert or redivert 195,000 acre-feet, except when the Delta is in Excess Water Conditions during July 1 through September 30, the diversion capacity at the south Delta intake to Clifton Court Forebay in excess of 7,180 cubic feet per second shall be shared equally by the State and the United States. This Article does not alter the Cross-Valley Canal contractors' priority to pumping at the Banks Pumping Plant, as now stated in Revised D-1641 (March 15, 2000).

C.12.5 Article 10(i) - Sharing of Export Capacity When Exports are Constrained

Article 10(i) was added to the COA to address the sharing of export capacity when exports are constrained by applicable Federal or state law requirements:

(i) Sharing of Applicable Export Capacity When Exports are Constrained: During periods when exports are constrained by non-discretionary requirements imposed on the Central Valley Project and the State Water Project South Delta exports by any federal or state agency, allowable applicable export capacity shall be shared by the following percentages:

- Balanced Water Conditions: United States 65%; California 35%
- Excess Water Conditions: United States 60%; California 40%.

Sharing of applicable export capacity during Balanced Water Conditions shall be considered a first right of refusal for the United States to use up to 65% of allowable export capacity after dividing any unstored water for export in accordance with 6(d).

C.13 State Water Project – Delta Division

C.13.1 Harvey O. Banks Pumping Plant

The Harvey O. Banks (Banks) Pumping Plant is in the south Delta, about 8 miles northwest of Tracy and marks the beginning of the California Aqueduct. The plant provides the initial lift of water 244 feet into the California Aqueduct by means of 11 pumps, including two rated at 375 cfs capacity, five at 1,130 cfs capacity, and four at 1,067 cfs capacity. Even though the installed capacity of Banks Pumping Plant is 10,670 cfs, the maximum conveyance capacity of the California Aqueduct limits the pumping rate to 10,300 cfs.

C.13.2 Clifton Court Forebay and Skinner Delta Fish Protection Facility

The Clifton Court Forebay (CCF) is a 31-TAF reservoir located in the southwestern edge of the Delta, about 10 miles northwest of the city of Tracy. The CCF provides storage to allow off-peak pumping of water exported through Banks Pumping Plant. The John E. Skinner Delta Fish Protective Facility is located west of the CCF, 2 miles upstream of the Banks Pumping Plant. The Skinner Fish Facility screens fish away from the pumps that lift water into the California Aqueduct. Large fish and debris are directed away from the facility by a 388-foot long trash boom. Smaller fish are diverted from the intake channel into bypasses by a series of metal louvers, while the main flow of water continues through the louvers and towards the pumps. These fish pass through a secondary system of screens and pipes into seven holding tanks, where a subsample is counted and recorded. The salvaged fish are then returned to the Delta in oxygenated tank trucks.

During the months of July, August, and September, the maximum allowable daily diversion rate into the CCF was increased from 13,870 acre-feet to 14,860 acre-feet and 3-day average diversions from 13,250 acre-feet to 14,240 acre-feet (500 cfs per day equals 990 acre-feet per day).

C.13.2.1 Louver Operations

Louver efficiency estimates for Chinook Salmon developed in the past 10 years are largely consistent with the findings of the original testing program for the Skinner Fish Facility (Skinner 1974) and used by CDFW to calculate loss. A summary of the findings of several contemporary studies are outlined below:

- Quantification of Pre-Screen Loss of Juvenile Steelhead in Clifton Court Forebay (California Department of Water Resources 2009)
    - Steelhead: This study determined efficiency for steelhead trout using releases of PIT tagged steelhead released at the Skinner Fish Facility trash rack. The study reported two estimates of efficiency; 74% (17% to 100 %) and 82% (19% to 100%). The latter value incorporates an estimate of emigration from the study area (e.g. “swim out”) which was documented in the study.
- Pre-screen loss and fish facility efficiency for Delta Smelt at the South Delta’s State Water Project, California (Castillo et al. 2012)
    - Delta Smelt: This study used releases of cultured, Calcein-marked juvenile and adult Delta Smelt released at the Skinner Fish Facility trash rack. Adult Delta Smelt efficiency was reported to range from 36% to 89%, while juvenile efficiency ranged from 24% to 30%.
- Skinner Evaluation and Improvement Study 2017 Annual Report (California Department of Water Resources 2019)
    - Chinook Salmon: This study utilized releases of PIT and acoustic tagged, fall run and late-fall run Chinook Salmon released at the Skinner Fish Facility when the radial gates were open from January through June. Pre-screen loss was estimated to be 56.07% (ranging 26.1% to 88.5%) for late-fall run and 92.1% (ranging 92.1% to

98.5%) for fall run Chinook Salmon. Whole facility efficiency was reported as 81.7% (ranging 77.9% to 86.2%) and 55.0% (ranging 54.3% and 55.7%) for "Salmon" and "Striped Bass" Operating Criteria, respectively.

The Skinner Fish Facility was built with a modular design including multiple primary louver bays that can be isolated, two secondary channels, and two holding tank buildings. Under most circumstances, this design effectively mitigates fish losses as a result of routine maintenance and cleaning, and mechanical breakdowns. Maintenance, cleaning, and breakdowns normally result in a reduction in overall available capacity rather than exports without salvage.

However, in the event of an unplanned outage (e.g, a power loss), attempts are made to immediately rectify the issue through changes in either the configuration of the facility (e.g. changing bays) or backup systems (e.g, alternate power source) and CDFW is notified. In the event of an unplanned outage lasting greater than 1 hour, CDFW is immediately consulted and/or Banks exports may be temporarily halted.

Planned outages are typically scheduled to avoid periods of unscreened water export.

The duration and frequency of louver cleaning operations fluctuates significantly due to a number of factors including pumping schedule, high fish counts, flow rates, debris loads, environmental factors, and staffing. In general:

- Cleaning of individual primary louver bays is performed weekly. It takes a minimum of two hours to clean each bay, and bays are isolated during cleaning to prevent fish losses. Cleaning is performed by lifting individual louver panels using a gantry crane and pressure washing them from both front and back.
- Cleaning of the secondary channels is performed twice weekly and is also used as a predator flush. It generally takes 30-60 minutes to clean each secondary bay. During cleaning, each channel is dewatered, and the louver or screen panels are pressure washed from each side using a fire hose. After the panels have been washed, the primary bypass valve(s) at the head each bay are opened rapidly to flush predators and debris into a holding tank for removal.

C.13.2.2 Operations and Monitoring

Approximately 52 different species of fish are entrained into the Skinner Fish Facility (and the TFCF, discussed below) each year; however, the total numbers are significantly different for the various species salvaged. Also, it is difficult, if not impossible, to determine exactly how many safely make it all the way to the collection tanks, to be transported back to the Delta. Hauling trucks, used to transport salvaged fish to release sites, inject oxygen and contain an eight parts per thousand salt solution to reduce stress.

When south Delta hydraulic conditions allow, and within the original design criteria for the fish collecting facilities, the louvers are operated based on the Biological Opinion objectives of achieving water approach velocities: for striped bass velocities of as close to 1 foot per second (ft/s) as possible from May 15 through October 31, and for salmon velocities of approximately 3 to 3.5 ft/s from November 1 through May 14.

Fish passing through the facility are sampled at intervals of 30 minutes every two hours year-round. Fish observed during sampling intervals are identified by species, measured to fork length, examined for marks or tags, and placed in the collection facilities for transport by tanker truck to the release sites in the North Delta away from the pumps. In addition, fish collection facility personnel monitor for the presence of spent female Delta Smelt in anticipation of expanding the salvage operations to include sub-20 mm larval Delta Smelt detection.

Fish collection facility personnel monitor for the presence of spent female Delta Smelt by euthanizing all adult Delta Smelt that are collected in the 30-minute fish count, determine the gender and the gonadal or sexual maturation stage of the Delta Smelt, and determining if the eggs have reached Stage IV, the stage when eggs are ready for release (0.9-10 mm in diameter and easily stripped). Stages V (i.e, post-vitellogenic stage) and VI (i.e, post-ovulatory or "spent" stage) are expected soon after Stage IV observation. Stages are determined and reported real-time when a biologist is present or the following morning after smelt detection and collection. Stage or gonad maturation is determined using egg stage descriptions from Mager (1996).

Larval smelt sampling at the fish collecting facilities commences once a trigger is met (detection of a spent female at CVP/SWP being one of three triggers). Fish count screen with a 2.4 mm mesh size opening is replaced with one that has a mesh size of 0.5 mm in order to retain larval fish. Sampling is done four times a day (04:00, 10:00, 16:00, 22:00) and all larval smelt are identified to species and reported the day after collection.

C.13.3 North Bay Aqueduct

The North Bay Aqueduct (NBA) intake is located approximately 10 miles from the main stem Sacramento River at the end of Barker Slough.

C.13.4 Barker Slough Pumping Plant

The Barker Slough Pumping Plant diverts water from Barker Slough into the NBA for delivery to the Solano County Water Agency and the Napa County Flood Control and Water Conservation District (NBA water contractors).

C.13.5 Suisun Marsh Facilities

C.13.5.1 Suisun Marsh Salinity Control Gates

The Suisun March Salinity Control Gates (SMSCG) are located on Montezuma Slough about two miles downstream from the confluence of the Sacramento and San Joaquin Rivers, near Collinsville. The objective of Suisun Marsh Salinity Control Gate operation is to decrease the salinity of the water in Montezuma Slough. The gates control salinity by restricting the flow of higher salinity water from Grizzly Bay into Montezuma Slough during incoming tides and retaining lower salinity Sacramento River water from the previous ebb tide. Operation of the gates in this fashion lowers salinity in Suisun Marsh channels and results in a net movement of water from east to west.

When Delta outflow is low to moderate and the gates are not operating, tidal flow past the gate is approximately 5,000 to 6,000 cfs while the net flow is near zero. When operated, flood tide flows are arrested while ebb tide flows remain in the range of 5,000 to 6,000 cfs. The net flow in

Montezuma Slough becomes approximately 2,500 to 2,800 cfs. The USACE permit for operating the SMSCG requires that it be operated between October and May only when needed to meet Suisun Marsh salinity standards. Historically, the gate has been operated as early as October 1, although in some years (e.g., 1996) the gate was not operated at all. When the channel water salinity decreases sufficiently below the salinity standards, or at the end of the control season, the project provides unrestricted movement through Montezuma Slough. Details of annual gate operations can be found in Summary of Salinity Conditions in Suisun Marsh During Water Years 1984–1992 (California Department of Water Resources 1994), or the Suisun Marsh Monitoring Program Data Summary produced annually by DWR's Division of Environmental Services.

The approximately 2,800 cfs net flow induced by SMSCG operation is effective at moving the salinity downstream in Montezuma Slough. Salinity is reduced by roughly 100 percent at Belden's Landing, and by lesser amounts farther west along Montezuma Slough. At the same time, the salinity field in Suisun Bay moves upstream as net Delta outflow (measured nominally at Chipps Island) is reduced by gate operation. Net outflow through Carquinez Strait is not affected.

The SMSCG are operated during the salinity control season, which spans from October to May. Operational frequency is affected by hydrologic conditions, weather, Delta outflow, tide, fishery considerations, and other factors. The gates have also been operated for scientific studies. After discussions with NMFS based on study findings, the boat lock portion of the gate is now held open at all times during SMSCG operation to allow for continuous salmon passage opportunity. Adaptive management of the gates continues to improve, and salinity standards have been met with less frequent gate operation since 2006. In low outflow years gate operation was used from 35 to 42 days. The operation was limited to 17 to 69 days in 2009, 2010, 2011 and 2013. Assuming no significant long-term changes in the drivers mentioned above, it is expected that gate operations will remain at current levels (17 to 69 days per year) except perhaps during the most critical hydrologic conditions and other conditions that affect Delta outflow.

C.13.5.2 Roaring River Distribution System

The Roaring River Distribution System (RRDS) is located in the southeastern Suisun Marsh and was constructed by the DWR and Reclamation in 1979 to mitigate for the effects on Marsh channel water salinity caused by Central Valley Project and State Water Project operations. The distribution system is used to convey less saline water from Montezuma Slough to managed 5,000 acres of private and 3,000 acres of CDFW managed wetlands on Simmons, Hammond, Van Sickle, Wheeler, and Grizzly Islands.

Salinity control is mandated by Water Board, Suisun Marsh Protection Plan, San Francisco Bay Conservation and Development Commission (Bay Conservation and Development Commission 1976), Plan of Protection for Suisun Marsh (California Department of Water Resources 1984) and associated Environmental Impact Report, and in response to Condition 7 of the Order to D-1485, superseded by Table C-3 of the Order to D-1641. DWR and Reclamation are required under the Suisun Marsh Preservation Agreement (Bureau of Reclamation et al. 1987) to operate and maintain the RRDS to provide lower salinity water to adjacent State and private landowners in the Marsh.

Diversions from Montezuma Slough typically occur from August through June. Water is diverted from the RRDS to the managed wetlands and circulated. The water is drained from the managed wetlands in spring, taking with it salts from the soil.

The RRDS includes an intake structure from Montezuma Slough consisting of eight 60-inch culverts with flap gates and slide gates. Managed wetlands north and south of the RRDS receive water, as needed, through publicly and privately-owned turnouts on the system. Between 1981 and 1982 fish screens were placed over the intake according to CDFW standards. After the listing of Delta Smelt, the RRDS diversion rates have been controlled to maintain an average approach velocity below 0.7 ft/s at the intake fish screen. The intake discharges to the 40-acre Hammond Island Pond at the southeast corner of CDFW property. Motorized slide gates in Montezuma Slough and flap gates in the pond control flows through the culverts into the pond. A manually operated flap gate and flashboard riser are located at the confluence of Roaring River and Montezuma Slough to allow drainage back into Montezuma Slough for controlling water levels in the distribution system and for flood protection. DWR owns and operates this drain gate to ensure the Roaring River levees are not compromised during extremely high tides. Approximately 8 miles of channel run from Hammond Island Pond to the western edge of Simmons Island. Several turnouts along the RRDS are operated and maintained by the CDFW and adjacent private landowners.

DWR conducts routine maintenance of the system, primarily maintaining the levee roads and fish screens. RRDS, similar to other levees in the marsh, has experienced subsidence.

C.13.5.3 Morrow Island Distribution System

The Morrow Island Distribution System (MIDS) was constructed in 1979 and 1980 in the southwestern Suisun Marsh as part of the Initial Facilities in the Plan of Protection for the Suisun Marsh. The contractual requirement for Reclamation and DWR is to provide water to the ownerships so that lands may be managed according to approved local management plans. The MIDS was constructed primarily to channel drainage water from the adjacent managed wetlands for discharge into Suisun Slough and Grizzly Bay. This approach increases circulation and reduces salinity in Goodyear Slough.

The MIDS is used year-round, but most intensively from September through June. When managed wetlands are filling and circulating, water is tidally diverted from Goodyear Slough just south of Pierce Harbor through three 48-inch culverts. Drainage water from Morrow Island is discharged into Grizzly Bay by way of the C-Line Outfall (two 36-inch culverts) and into the mouth of Suisun Slough by way of the M-Line Outfall (three 48-inch culverts), rather than back into Goodyear Slough. This helps prevent increases in salinity due to drainage water discharges into Goodyear Slough. The M-Line ditch is approximately 1.6 miles long and the C-Line ditch is approximately 0.8 miles long.

Reclamation and DWR operate the Goodyear Slough Outfall to improve water circulation in the Suisun Marsh. This structure consists of four 48-inch diameter culverts with flap gates designed to drain water from the southern end of Goodyear Slough into Suisun Bay. On flood tides, the gates reduce the amount of tidal inflow into Goodyear Slough.

C.13.6 California Aqueduct

Banks Pumping Plant lifts water into the California Aqueduct, which then flows to Bethany Reservoir. From Bethany Reservoir, the South Bay Pumping Plant lifts water into the South Bay Aqueduct to supply portions of Alameda and Santa Clara counties. The South Bay Aqueduct provided initial deliveries in 1962 and has been fully operational since 1965. South Bay Aqueduct facilities include Lake Del Valle and Patterson Reservoir.

From Bethany Reservoir, the 444-mile-long California Aqueduct conveys water to the primarily agricultural lands of the San Joaquin Valley and the mainly urban regions of Southern California. The first SWP deliveries to San Joaquin Valley contractors began in 1968. The first SWP deliveries to southern California began in 1972. The California Aqueduct winds along the west side of the San Joaquin Valley. It transports water to O'Neill Forebay. Water in the Forebay can be released to the San Luis Canal or pumped into San Luis Reservoir by the Gianelli Pumping Plant.

San Luis Reservoir has a storage capacity of more than 2 MAF and is a joint facility of the DWR and Reclamation. The SWP's share of the reservoir's gross storage is about 1,062,180 acre-feet.

C.14 References

Bay Conservation and Development Commission. 1976. Suisun Marsh Protection Plan. Available at: https://bcdc.ca.gov/resources/plans/suisun-marsh-protection-plan/.

California Department of Water Resources (DWR). 1984. *1984 Plan of Protection for the Suisun Marsh*.

California Department of Water Resources (DWR). 1994. *California Water Plan Update Volume 1. Bulletin 160 93*. October. Accessed on March 21, 2023. Available at: https://openlibrary.org/books/OL1241012M/California_water_plan_update.

California Department of Water Resources (DWR). 2009. *Quantification of Pre-Screen Loss of Juvenile Chinook Salmon in Clifton Court Forebay*. Bay-Delta Office. March. Accessed on March 23, 2023. Available at: https://www.waterboards.ca.gov/waterrights//water_issues/programs/bay_delta/docs/cmnt081712/srcsd/juvisteelheadlossquantification.pdf.

California Department of Water Resources. 2014a. Division of Safety of Dams, Listing of Dams. Available at: http://www.water.ca.gov/damsafety/damlisting/.

California Department of Water Resources. 2014b. California Data Exchange Center, Reservoir Information, Sorted by Dam Name. Available at: http://cdec.water.ca.gov/misc/resinfo.html.

California Department of Water Resources (DWR). 2019. Skinner Evaluation and Improvement Study Annual Report. February.

California Department of Water Resources (DWR). 2023a. California Data Exchange Center: Trinity Lake (CLE), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023b. California Data Exchange Center: Trinity Lake (CLE), Daily Reservoir Elevation (Sensor 6-daily). Site accessed December 2018. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023c. California Data Exchange Center: Lewiston (LEW), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023d. California Data Exchange Center: Lewiston (LEW), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023e. California Data Exchange Center: Whiskeytown Dam (WHI), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023f. California Data Exchange Center: Whiskeytown Dam (WHI), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023g. California Data Exchange Center: Shasta Dam (SHA), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023h. California Data Exchange Center: Shasta Dam (SHA), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023i. California Data Exchange Center: Keswick Reservoir (KES), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023j. California Data Exchange Center: Keswick Reservoir (KES), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023k. California Data Exchange Center: Folsom Lake (FOL), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023l. California Data Exchange Center: Folsom Lake (FOL), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023m. California Data Exchange Center: Lake Natoma (Nimbus Dam) (NAT), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023n. California Data Exchange Center: Lake Natoma (Nimbus Dam) (NAT), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023o. California Data Exchange Center: Millerton Lake (MIL), Monthly Reservoir Storage (Sensor 15-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023p. California Data Exchange Center: Millerton Lake (MIL), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023q. California Data Exchange Center: Millerton Lake (MIL), Daily Reservoir Outflows (Sensor 23-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023r. California Data Exchange Center: New Melones Reservoir (NML), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023s. California Data Exchange Center: New Melones Reservoir (NML), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023t. California Data Exchange Center: Goodwin Dam (GDW), Daily Reservoir Storage (Sensor 15-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023u. California Data Exchange Center: Goodwin Dam (GDW), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023v. California Data Exchange Center: Stanislaus River at Orange Blossom Bridge (OBB), Mean Daily Flows (Sensor 41-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023w. California Data Exchange Center: Jones Pumping Plant (TRP), Discharge Flows (Sensor 70-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023x. California Data Exchange Center: San Luis Reservoir (SNL), Monthly Reservoir Storage (Sensor 15-monthly). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources (DWR). 2023y. California Data Exchange Center: San Luis Reservoir (SNL), Daily Reservoir Elevation (Sensor 6-daily). Accessed on March 17, 2023. Available at: https://cdec.water.ca.gov/dynamicapp/selectQuery.

California Department of Water Resources et al. 2013

California North Coast Regional Water Quality Control Board et al. 2009

Castillo, G., J. Morinaka. J. Lindberg. R. Fujimura, B. Baskerville-Bridges, J. Hobbs, G. Tigan, and L. Ellison. 2012. "Pre-screen loss and fish facility efficiency for Delta Smelt at the South Delta's State Water Project, California." *San Francisco Estuary and Watershed Science*, 10(4).

Central Valley Project Documents, Part One, Authorizing Documents. 1956. Available online at https://cawaterlibrary.net/document/central-valley-project-documents-part-one-authorizing-documents/. Accessed June 20, 2024.

City and County of San Francisco 2009

City of San Diego. 2019a. Reservoirs: Hodges Reservoir. Site accessed June 19, 2019. https://www.sandiego.gov/reservoirs-lakes/hodges-reservoir.

City of San Diego. 2019b. Reservoirs: El Capitan Reservoir. Site accessed June 19, 2019. https://www.sandiego.gov/reservoirs-lakes/el-capitan-reservoir.

City of San Diego. 2019c. Reservoirs: Murray Reservoir. Site accessed June 19, 2019. https://www.sandiego.gov/reservoirs-lakes/murray-reservoir.

City of San Diego. 2019d. Reservoirs: Lower Otay Reservoir. Site accessed June 19, 2019. https://www.sandiego.gov/reservoirs-lakes/lower-otay-reservoir.

EBMUD (East Bay Municipal Utility District). 2011. *Urban Water Management Plan 2010*. June.

Mager, R. C. 1996. *Gametogenesis, reproduction, and artificial propagation of delta smelt, Hypomesus transpacificus*. Doctoral dissertation. University of Davis at California.

San Diego County Water Authority and U.S. Army Corps of Engineers. 2008. Final Environmental Impact Report/Environmental Impact Statement for the Carryover Storage and San Vicente Dam Raise Project. April.

Santa Clara Valley Water District 2011

Skinner, J.E. 1974. "A functional evaluation of a large louver screen installation and fish facilities research on California water diversion projects." In *Proceedings of the Second Entrainment and Intake Screening Workshop*. L.D. Jensen, Ed. Report 15. Johns Hopkins University Cooling Water Research Project. Baltimore, MD.

State Water Resources Control Board (SWRCB). 2012. *Public Draft, Substitute Environmental Document in Support of Potential Changes to the Water Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality*. December.

State Water Resources Control Board. 2018. *Bay-Delta Water Quality Control Plan.* Available at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/2018_sed/.

Trinity River Restoration Program (TRRP). 2014. Typical Releases. Accessed on March 22, 2023. Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/2012_sed/docs/.

U.S. Department of the Interior (DOI). 2014. *Trinity River Division Authorization's 50,000 acre-foot Proviso and the 1959 Contract between the Bureau of Reclamation and Humboldt County, from Solicitor to Secretary of the Department of the Interior*. December.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 1989. *Report on Refuge Water Supply Investigations.* Available at: https://www.usbr.gov/mp/cvpia/3406d/resc_docs/Report%20on%20Refuge%20Water%20Supply%20Investigations%20Ch5%20('89%20Report).pdf

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 1994. *San Felipe Division, The Central Valley Project.*

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 1997. *Draft Central Valley Project Improvement Act – Programmatic Environmental Impact Statement/Report.* September.

Reclamation (Bureau of Reclamation). 2011. Shasta/Trinity River Division Project, Project Data. April 2011. http://www.usbr.gov/projects/Project.jsp?proj_Name=Shasta/Trinity River Division Project&pageType=ProjectDataPage.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2013. *Shasta Lake Water Resources Investigation Draft Environmental Impact Statement*. June.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2014a. Orland Project. Site accessed September 14, 2014. http://www.usbr.gov/projects/Project.jsp?proj_Name=Orland+Project.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2014b. San Luis Unit Project. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=San Luis Unit Project.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2014c Reclamation (Bureau of Reclamation). 2014c. Cachuma Project. Available at: http://www.usbr.gov/projects/Project.jsp?proj_Name=Cachuma+Project.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation), California Department of Water Resources (DWR), California Department of Fish and Game (CDFG) (now known as California Department of Fish and Wildlife [CDFW]), and Suisun Resource Conservation District. 1987. *Original Suisun Marsh Preservation Agreement*. March.

U.S. Bureau of Reclamation (Reclamation). 1989. "Report on Refuge Water Supply Investigations: Central Valley Hydrologic Basin, California." Mid Pacific Region.

U.S. Fish and Wildlife Service (USFWS). 1993. *The Relationship Between Instream Flow and Physical Habitat Availability for Chinook Salmon in the Stanislaus River, California*. May.