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Attorneys for Plaintiffs and Petitioners

BY FAX

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA
IN AND FOR THE COUNTY OF SHASTA

FRIENDS OF THE RIVER; GOLDEN GATE SALMON ASSOCIATION; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS INSTITUTE FOR FISHERIES RESOURCES; SIERRA CLUB; DEFENDERS OF WILDLIFE; and NATURAL RESOURCES DEFENSE COUNCIL,

Plaintiffs and Petitioners,

v.

WESTLANDS WATER DISTRICT; and DOES 1-20,

Defendants and Respondents.

Case No. 192490

DECLARATION OF NINA C. ROBERTSON IN SUPPORT OF REQUEST FOR JUDICIAL NOTICE IN SUPPORT OF PLAINTIFFS' OPPOSITION TO DEFENDANT'S MOTION TO TRANSFER ACTION FROM SHASTA COUNTY TO FRESNO COUNTY

Date: July 22, 2019
Time: 8:30 a.m.
Dept: 8
Judge: Hon. Tamara L. Wood
Trial Date: April 14, 2020
Action Filed: May 13, 2019

I, Nina C. Robertson, declare as follows:

1. I am an attorney of record for Plaintiffs and Petitioners in this action. I make this declaration based upon my own personal knowledge and, if called upon to testify, could and would do so competently.

2. I am an attorney admitted to practice law in the State of California and a member of the Bar of the State of California.

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2. I am an attorney admitted to practice law in the State of California and a member of the Bar of the State of California.

3. Attached hereto as Exhibit A is a true and correct copy of the U.S. Bureau of Reclamation's "Key Anticipated Actions" for the "Shasta Dam Raise & Enlargement Project." I obtained this project timeline by accessing the U.S. Bureau of Reclamation's website at: https://www.usbr.gov/mp/ncao/docs/sdrep-timeline.pdf.

4. Attached hereto as Exhibit B are relevant excerpts of a document titled "Westlands Water District - Financial Statements and Supplementary Information with Independent Auditor's Report" and dated February 28, 2018. I obtained the document by accessing Westlands Water District's website at: https://wwd.ca.gov/wp-content/uploads/2019/06/financial-statements-supplementary-info-02-28-18.pdf.

5. Attached hereto as Exhibit C are excerpts of a document titled "Shasta Lake Water Resources Investigation, California Final Environmental Impact Statement." It was prepared by the United States Department of the Interior, Bureau of Reclamation - Mid-Pacific Region and it is dated December 2014. I obtained the document by accessing the Bureau of Reclamation's website at: https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=1915.

6. Attached hereto as Exhibit D is a true and correct copy of the January 14, 2019 letter from Eileen Sobeck, Executive Director, California State Water Resources Board, to Jose Gutierrez, Westlands Water District, regarding "Comments on Westlands Water District's Initial Study/Notice of Preparation for the Shasta Dam Raise Project; Shasta County." I received a copy of the letter from Westlands Water District in response to an information request submitted pursuant to the California Public Records Act.

7. Attached hereto as Exhibit E is a true and correct copy of a letter dated January 14, 2019 from Tina Bartlett, Regional Manager, California Department of Fish and Wildlife, to Jose Gutierrez of Westlands Water District, entitled "Review of the Initial Study and Notice of Preparation for the Shasta Dam Raise Project, State Clearinghouse Number 2018111058, Shasta and Tehama Counties." I received a copy of the letter from Westlands Water District in response to an information request submitted pursuant to the California Public Records Act.

8. Attached hereto as Exhibit F is a true and correct copy of Westlands Water District's "Initial Study/Notice of Preparation for the Shasta Dam Raise Project Environmental Impact

Report." I received a copy of the document from Westlands in response to an information request submitted pursuant to the California Public Records Act.

9. Attached hereto as Exhibit G is a true and correct copy of a document identified as "Westlands Water District Board of Directors Meeting, September 18, 2018, Item 15. The stated "subject" is "Consider Authorizing the District to Retain Consultants to Prepare an Environmental Impact Report Pursuant to the California Environmental Quality Act for the Shasta Lake Water Resources Investigation (Raising Shasta Reservoir)." I received a copy of the board meeting item from Westlands Water District in response to an information request submitted pursuant to the California Public Records Act.

10. Attached hereto as Exhibit H is a true and correct copy of an email dated February 11, 2018 from David van Rijn, Regional Planning Officer for Bureau of Reclamation's Mid-Pacific Region, to Russ Freeman, Deputy General Manager – Resources, Westlands Water District, with the subject "Shasta Raise – Agreement in Principle for Potential Cost Sharing." I received a copy of this email from the Bureau of Reclamation in response to an information request submitted pursuant to the federal Freedom of Information Act.

11. Attached hereto as Exhibit I is a true and correct copy of an email dated March 6, 2019 from Jose Gutierrez, Chief Operating Officer of the Westlands Water District, to officials representing various other California public water agencies, with the subject "Update on Shasta Dam Raise Project." I received a copy of this email from Rebecca Akroyd, General Counsel of the San Luis Delta-Mendota Water Authority, in response to an information request submitted pursuant to the California Public Records Act.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on July 8, 2019 in San Francisco, California.

NINA C. ROBERTSON

EXHIBIT A

RECLAMATION
Managing Water in the West

U.S. Department of the Interior
Bureau of Reclamation

Shasta Dam Raise & Enlargement Project

Key Anticipated Actions

Now: Design and Pre-Construction

- $20 Million through the WIIN Act
- Planning for Real Estate Impacts

Spring 2019: Award Land Consultant Contract (funding delayed)

Summer 2019: Begin Lands Process Surveys (funding delayed)

August 2019: Secure 50% Cost-Share Partner

September 2019: Issue Record of Decision

December 2019: Award Construction Contract

February 2024: Fill Reservoir

EXHIBIT B

Westlands Water District

Fresno, California

FINANCIAL STATEMENTS AND SUPPLEMENTARY INFORMATION
WITH INDEPENDENT AUDITORS' REPORT

February 28, 2018

K·COE
ISOM

WESTLANDS WATER DISTRICT

Audited Financial Statements – Table of Contents

INDEPENDENT AUDITORS' REPORT

To the Board of Directors
Westlands Water District
Fresno, California

Report on the Financial Statements

We have audited the accompanying financial statements of the business-type activities of Westlands Water District (the District), as of and for the year ended February 28, 2018, and the related notes to the financial statements, which collectively comprise the District's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

The District's management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America as well as the accounting systems prescribed by the State Controller's Office and state regulations governing special districts; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express opinions on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States and the State Controller's *Minimum Audit Requirements and Reporting Guidelines for California Special Districts*. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the District's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the District's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the respective financial position of the business-type activities of the District, as of February 28, 2018, and the respective changes in financial position and cash flows thereof for the year then ended in accordance with accounting principles generally accepted in the United States of America as well as the accounting systems prescribed by The State Controller's Office and state regulations governing special districts.

Other Matters

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis and the required supplementary information listed on the table of contents be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated September 13, 2018 on our consideration of the District's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the District's internal control over financial reporting and compliance.

KCoe Isom, LLP

September 13, 2018
Fresno, California

NOTE J – REAL PROPERTY HELD

Real property held consisted of the following at February 28, 2018:

Land held under land and water acquisition programs	$ 48,951,035
Land held for future use	597,734
McCloud River property	32,889,157
Yolo Ranch property	20,253,531
Total	$102,691,457

In fiscal year 2006-2007, the District acquired approximately 3,000 acres of property located in Shasta County, California, along the McCloud River. The property was acquired to facilitate the raising of Shasta Dam by the United States Department of the Interior. Until that time, or for a period of 25 years from the closing date, the District has agreed to maintain the property as a private fishing club. A separate enterprise fund has been established to report the financial transactions of the fishing club.

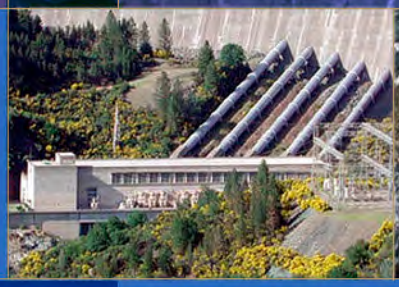
In fiscal year 2007-2008, the District acquired approximately 3,400 acres of property located in Yolo County, California. The property was acquired to pursue projects to address water supply-related environmental and/or Endangered Species Act issues. Acquisition of this property included 3,582 shares of Sweetwater Company, a mutual water company. The District's shares represents 83.07% of the total ownership.

EXHIBIT C

Department of the Interior Final

Shasta Lake Water Resources Investigation

Environmental Impact Statement




December 2014

Mission Statements

Protecting America's Great Outdoors and Powering Our Future

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Final Environmental Impact Statement
Shasta Lake Water Resources Investigation

United States Department of the Interior
Bureau of Reclamation, Mid-Pacific Region
2800 Cottage Way, MP-700
Sacramento, CA 95825

This Final Environmental Impact Statement (EIS) for the Shasta Lake Water Resources Investigation (SLWRI) has been prepared by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), Mid-Pacific Region, consistent with requirements of the National Environmental Policy Act (NEPA). Cooperating agencies pursuant to NEPA include the U.S. Forest Service, Bureau of Indian Affairs, Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians, and U.S. Army Corps of Engineers.

The SLWRI is a feasibility study that is one of five studies for potential surface water storage projects included in the 2000 CALFED Bay-Delta Programmatic Record of Decision, and is being conducted under the general authority of Public Laws 96-375, which was reaffirmed under Public Law 108-361, also known as the CALFED Bay-Delta Authorization Act.

This EIS evaluates the potential environmental effects of alternative plans to enlarge Shasta Dam and Reservoir to (1) increase anadromous fish survival in the upper Sacramento River, primarily upstream from Red Bluff Pumping Plant, (2) increase water supplies and water supply reliability for agricultural, municipal and industrial, and environmental purposes, and (3) address related water resource problems, needs, and opportunities. In addition to the No-Action Alternative, this DEIS considers multiple action alternatives, which include potential dam raises ranging from 6.5 to 18.5 feet and related reservoir enlargements ranging from 256,000 to 634,000 acre feet.

In June 2013, Reclamation released the SLRWI Draft Environmental Impact Statement (DEIS) and appendices to the public. The public comment period closed September 2013. Over 600 comment letters were received on the DEIS. The Final EIS and related appendices include responses to public comments (Chapter 33, “Public Comments and Responses”) and related refinements to alternatives and impact evaluations and the identification of the preferred alternative.

For further information, please contact Katrina Chow, Project Manager, at the address above, by telephone at (916) 978-5067, or by e-mail at KChow@usbr.gov.

Shasta Lake Water Resources Investigation, California

Shasta Lake Water Resources Investigation, California Final Environmental Impact Statement

Prepared by:

United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

December 2014

Executive Summary

S.1 Introduction and Background

This Environmental Impact Statement (EIS) has been prepared as part of the Shasta Lake Water Resources Investigation (SLWRI) to evaluate the potential physical, biological, cultural, and socioeconomic effects of implementing alternatives to modify the existing Shasta Dam and Reservoir, including taking no action. The SLWRI is a feasibility study being conducted by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation), Mid-Pacific Region.

The SLWRI is being conducted consistent with the National Environmental Policy Act (NEPA), the 1983 U.S. Water Resources Council *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G) (WRC 1983), and other pertinent Federal, State of California (State), and local laws and policies. Reclamation is serving as the Federal lead agency for compliance with NEPA. Cooperating agencies, pursuant to NEPA, include the U.S. Department of Agriculture, Forest Service (USFS); Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians; U.S. Army Corps of Engineers (USACE); and U.S. Department of the Interior (Interior), Bureau of Indian Affairs (BIA). This document has also been prepared in consideration of California Environmental Quality Act (CEQA) requirements.

Reclamation completed the *SLWRI Draft Feasibility Report* (Draft Feasibility Report), *SLWRI Preliminary Draft EIS* (Preliminary DEIS), and related appendices in November 2011. These documents were released to the public in February 2012 to present potential impacts, costs, and benefits of the action alternatives that had been evaluated at that time; to share information generated since the completion of the *SLWRI Plan Formulation Report* in December 2007; and to provide an additional opportunity for public and stakeholder input.

After the release of the Draft Feasibility Report and Preliminary DEIS, SLWRI alternatives were refined for the Draft EIS (DEIS) based on several factors, including updates to Central Valley Project (CVP) and State Water Project (SWP) water operations, and stakeholder input. Water operations modeling and related evaluations for the DEIS and this Final EIS reflect the following:

- The Reclamation 2008 *Biological Assessment on the Continued Long-Term Operations of the CVP and SWP* (2008 Long-Term Operation Biological Assessment (BA))

- The U.S. Department of Interior, Fish and Wildlife Service (USFWS) 2008 *Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the CVP and SWP* (2008 USFWS Biological Opinion (BO))

- The National Marine Fisheries Service (NMFS) 2009 *BO and Conference Opinion on the Long-Term Operations of the CVP and SWP* (2009 NMFS BO)

- Additional changes in CVP and SWP facilities and operations, such as implementation of the San Joaquin River Restoration Program

- Additional changes in non-CVP/SWP facilities and operations, such as the addition of the Freeport Regional Water Project

Reclamation released the DEIS for public review and comment in June 2013. In compliance with NEPA, a Notice of Availability (NOA) was published by Reclamation in the *Federal Register* (Federal Register Vol. 78, No. 126, 39315) on Monday, July 1, 2013, and an associated NOA was published by the U.S. Environmental Protection Agency (EPA) in the *Federal Register* (Federal Register Vol. 78, No. 129, 40474) on Friday, July 5, 2013.

Reclamation held three public workshops and three public hearings during the comment period on the DEIS. Each set of meetings were held in Redding, Sacramento, and Los Banos. Written and verbal comments were accepted at meetings and written comments were accepted throughout the comment period. The comment period on the DEIS began on July 1, 2013 and closed on September 30, 2013.

The public comments have been reviewed and, in accordance with NEPA Council on Environmental Quality (CEQ) Regulations, responses have been developed for all substantive comments and revision of the DEIS have been made to clarify and enhance the text to produce this SLWRI Final EIS. This Final EIS consists of revised chapters 1 through 31, a new Chapter 32, “Final EIS,” a new Chapter 33, “Public Comments and Responses,” and revised and new appendices.

During the process of addressing public comments on the DEIS, some notable content changes were made to this Final EIS, including:

- Refinement of the project purpose statement

- Clarification of the relationship of this EIS and tiering to the CALFED Bay-Delta Program (CALFED) Programmatic Environmental Impact Statement/Environmental Impact Report (PEIS/R)

- Refinement of the operational scenarios focused on anadromous fish survival, and the development, evaluation, and incorporation of Comprehensive Plan 4A (CP4A)

- Refinement of facility plans for recreation relocations, Shasta Dam modifications, Pit 7 Dam and Powerhouse modifications, and other reservoir area relocations (e.g., power transmission lines)

- Incorporation of updated resource information related to physical and biological resources in the primary study area

- Refinement of "maximum" affected areas and refinement of "most likely" affected areas for biological resources, based on facility and construction footprints

- Refinement and enhancement of the mitigation measures, including development of a framework to quantify impacts (where appropriate) and establish mitigation ratios that are applicable to a number of impacts related to biological resources, in conjunction with an interagency, interdisciplinary team

S.1.1 Background

Reclamation completed constructing Shasta Dam and Reservoir in 1945. Reclamation operates Shasta Dam and Reservoir, in conjunction with other facilities, to provide flood damage reduction and irrigation and municipal and industrial (M&I) water supply, maintain navigation flows, protect fish in the Sacramento River and the Sacramento-San Joaquin Delta (Delta), and generate hydropower. The Central Valley Project Improvement Act (CVPIA), enacted in 1992, added "fish and wildlife mitigation, protection, and restoration" as a priority equal to water supply, and "fish and wildlife enhancement" as a priority equal to hydropower generation. Major modifications to Shasta Dam include construction of a temperature control device (TCD) in 1997 for improved management of water temperatures in the upper Sacramento River.

Shasta Dam Under Construction

Shasta Dam and Reservoir were constructed as an integral element of the CVP, with Shasta Reservoir representing about 41 percent of the total reservoir storage capacity of the CVP. The 602-foot-tall Shasta Dam (533 feet above the streambed) and 4.55 million-acre-foot (MAF) Shasta Reservoir are located on the upper Sacramento River in Northern California, north of the City of Redding (see Figure S-1) within the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). Shasta Lake supports extensive water-oriented recreation. Recreation within these lands is managed by USFS.

In 2000, as a result of the CALFED Programmatic Record of Decision (ROD), increasing demands for water supplies, and growing concerns over declines in ecosystem resources in the Central Valley of California, Reclamation reinitiated a feasibility investigation to evaluate the potential for enlarging Shasta Dam and Reservoir.

Figure S-1. Location of Shasta Dam and Reservoir

S.2 Study Authorization

The SLWRI is being conducted under the authority of Public Law 96-375, which was reaffirmed under Public Law 108-361, also known as the CALFED Bay-Delta Authorization Act. Public Law 96-375 (October 3, 1980) provides

the authority for conducting a feasibility study for the SLWRI. It allows the Secretary of the Interior to:

> *…engage in feasibility studies relating to enlarging Shasta Dam and Reservoir, Central Valley Project, California or to the construction of a larger dam on the Sacramento River, California, to replace the present structure.*

Section 103(c), "Authorizations for Federal Activities Under Applicable Law," of the CALFED Bay-Delta Authorization Act (Public Law 108-361, October 25, 2004), authorizes the Secretary of the Interior to carry out the activities described in paragraphs (1) through (10) of Subsection (d), which include:

> *…(1)(A)(i) planning and feasibility studies for projects to be pursued with project-specific study for enlargement of (1) the Shasta Dam in Shasta County.*

Also, Section 103(a)(1) of Public Law 108-361 (October 25, 2004) states the following:

> *The Record of Decision is approved as a general framework for addressing the CALFED Bay-Delta Program, including its components relating to water storage, ecosystem restoration, water supply reliability (including new firm yield), conveyance, water use efficiency, water quality, water transfers, watersheds, the Environmental Water Account, levee stability, governance, and science.*

The CALFED Programmatic ROD called for the Secretary of the Interior to conduct feasibility studies for expanding CVP storage in Shasta Lake to:

> *…increase the pool of cold water available to maintain lower Sacramento River temperatures needed by certain fish and provide other water management benefits, such as water supply reliability.*

Other Federal legislation influences the SLWRI. Two laws of special note are Public Law 89-336 (November 8, 1965) and Public Law 102-575 (October 30, 1992). Public Law 89-336 created the Whiskeytown-Shasta-Trinity NRA, which includes Shasta Dam and Reservoir. Public Law 102-575, the CVPIA, directed numerous changes to CVP operations. Among these changes was adding "fish and wildlife protection, restoration, and enhancement" as a project purpose, which would result in substantial changes to water supply deliveries, river flows, and related environmental conditions in the primary and extended study areas.

S.3 Intended Use of Environmental Impact Statement

The purpose of an EIS is not to recommend approval or rejection of a project, but to provide information to aid the public and decision makers/permitting agencies in the decision-making process. An EIS identifies and evaluates alternatives that meet the project objectives, analyzes the potential environmental effects, and identifies measures to reduce or avoid potential environmental effects resulting from the action alternatives (i.e., mitigation measures). An EIS also must disclose adverse environmental impacts that cannot be avoided, cumulative impacts, the relationship of short-term uses and long-term productivity, and irreversible and irretrievable commitments of resources. In addition, NEPA requires that an EIS consider indirect effects of a project, which are often the result of growth inducement.

The SLWRI is one of five surface storage projects recommended for project-specific studies in the 2000 CALFED PEIS/R Preferred Program Alternative and associated CALFED Programmatic ROD. Consistent with guidance in the CALFED Programmatic ROD, this EIS relies on and tiers to the CALFED PEIS/R.

The SLWRI DEIS was released to the public in June 2013 and was circulated for review and comment by agencies, stakeholders, and the public to inform and engage interested persons in the planning and NEPA processes. Public outreach, including public workshops and hearings, was conducted during the 90-day DEIS public review period. Comments received during the public review period were considered and addressed and all comments and responses to comments are included in this Final EIS.

Reclamation posted the Final EIS at http://www.usbr.gov/mp/slwri for public review and issued a notice in the Federal Register and press release describing the public release of the Final EIS. It will be used by the Federal lead agency when considering approval of the proposed action or an alternative to the proposed action. All cooperating agencies and other Federal, State, and local agencies with permitting or approval authority over any aspect of the proposed action are expected to use the information contained in this Final EIS to meet most, if not all, of their information needs to make decisions and/or issue permits with respect to the proposed action.

S.4 Purpose and Need/Project Objectives

NEPA regulations require a statement of “the underlying purpose and need to which the agency is responding in proposing the alternatives, including the proposed action” (Title 40, Code of Federal Regulations (CFR) Part 1502.13). In California, the State CEQA Guidelines require a clearly written statement of objectives, including the underlying purpose of a proposed project (Title 14, California Code of Regulations Section 15124(b)).

S.4.1 Project Purpose and Objectives

Project Purpose

The purpose of the proposed action is to improve operational flexibility of the Sacramento-San Joaquin Delta (Delta) watershed system to meet specified primary and secondary project objectives.

Project Objectives

Two primary project objectives (also referred to as planning objectives) and five secondary project objectives were developed for the SLWRI:

Primary Project Objectives

- Increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from Red Bluff Pumping Plant (RBPP)
- Increase water supply and water supply reliability for agricultural, M&I, and environmental purposes, to help meet current and future water demands, with a focus on enlarging Shasta Dam and Reservoir

Secondary Project Objectives

- Conserve, restore, and enhance ecosystem resources in the Shasta Lake area and along the upper Sacramento River
- Reduce flood damage along the Sacramento River
- Develop additional hydropower generation capabilities at Shasta Dam
- Maintain and increase recreation opportunities at Shasta Lake
- Maintain or improve water quality conditions in the Sacramento River downstream from Shasta Dam and in the Delta

Primary project objectives are those which specific alternatives are formulated to address. The two primary project objectives are considered to have coequal priority, with each pursued to the maximum practicable extent without adversely affecting the other. Secondary project objectives are considered to the extent possible through pursuit of the primary project objectives.

S.4.2 Project Need

The need for the proposed action is described below and summarized from the 2004 Reclamation *SLWRI Initial Alternatives Information Report*, the 2007 Reclamation *SLWRI Plan Formulation Report*, the 2011 *Draft Feasibility Report* (released in 2012), and the Plan Formulation Appendix.

Anadromous Fish Survival

The Sacramento River system supports four separate runs of Chinook salmon: fall-, late fall-, winter-, and spring-run. The adult populations of the four runs of salmon and other important fish species that spawn in the upper Sacramento

River have declined considerably over the last 40 years. Several fish species in the upper Sacramento River have been listed under the Federal Endangered Species Act: Sacramento River winter-run Chinook salmon (endangered), Central Valley spring-run Chinook salmon (threatened), Central Valley steelhead (threatened), and the Southern Distinct Population Segment of North American green sturgeon (threatened). Two of these species are also listed under the California Endangered Species Act: Sacramento River winter-run Chinook salmon (endangered) and Central Valley spring-run Chinook salmon (threatened).

Unsuitable water temperatures in the upper Sacramento River, especially in dry and critical years,[1] is a critical factor affecting the abundance of Chinook salmon and steelhead in the river. Water temperatures that are too high or, less commonly, too low, can be detrimental to the various life stages of Chinook salmon. Elevated water temperatures can negatively impact holding and spawning adults, egg viability and incubation, preemergent fry, and rearing juveniles and smolts, substantially diminishing the next generation of returning spawners. Stress caused by high water temperatures also may reduce the resistance of fish to parasites, disease, and pollutants. Releases of cold water from Shasta Reservoir can improve seasonal water temperatures in the Sacramento River downstream from Shasta Dam for anadromous fish during critical periods.

Various Federal, State, and local projects are addressing factors contributing to declines in anadromous fish populations. Recovery actions range from changing the timing and magnitude of reservoir releases to structural changes at Shasta Dam. Despite these steps, additional actions are needed to address anadromous fish survival in the upper Sacramento River.

Water Supply Reliability

Demands for water in California exceed available supplies. Reclamation's 2008 *Water Supply and Yield Study* describes dramatic increases in statewide population, land use changes, regulatory requirements, and limitations on storage and conveyance facilities that have resulted in unmet water demands and subsequent increases in competition for water supplies among urban, agricultural, and environmental uses. The California Department of Water Resources (DWR) *California Water Plan Update 2013* concludes that California is facing one of the most significant water crises in its history; drought impacts are growing, and climate change is affecting statewide hydrology. Challenges are greatest during dry years, when water supplies are less available. Despite significant physical improvements in water resource systems and in system management over the past few decades, California still faces unreliable water supplies, continued depletion and degradation of

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

groundwater resources, habitat and species declines, and unacceptable risks from flooding.

As the population of California grows, and the demand for adequate water supplies becomes more acute, the ability to maintain a healthy and viable industrial and agricultural economy while protecting aquatic species will be increasingly difficult. Compounding these issues, potential effects of climate change, such as changed precipitation patterns, less snowfall, and earlier snowmelt, may considerably increase the demands on available water supplies in the future. As owner and operator of the CVP, one of the largest water storage and conveyance systems in the world, Reclamation has identified the need to increase the reliability of CVP water deliveries to its water contractors, particularly during dry and critical water years. Similar needs and challenges are faced by the SWP and other water projects throughout the State. As one of many efforts to improve the reliability of California's water supply, the SLWRI was established to evaluate the potential to improve water supply reliability, primarily by modifying Shasta Dam and enlarging Shasta Lake.

Ecosystem Resources

The quantity, quality, diversity, and connectivity of riparian, wetland, floodplain, and shaded riverine habitat in along the Sacramento River have been severely limited through confinement of the river system by levees, reclamation of adjacent lands for farming, bank protection, construction of dams and reservoirs, channel stabilization, and land development, contributing to a decline in habitat and native species populations. Ecosystem restoration along the Sacramento River has been the focus of several ongoing programs, including the Senate Bill 1086 Program, CVPIA, CALFED, Central Valley Habitat Joint Venture, and numerous local programs within the Central Valley. Despite these efforts, a significant need remains to conserve and restore ecosystem resources along the Sacramento River.

Flood Management

Communities and agricultural lands in the Central Valley are subject to flooding along the Sacramento River that poses risks to human life, health, safety, and property. Physical impacts from flooding include damage to buildings, contents, automobiles, agricultural crops, equipment, etc. Threats from flooding are caused by many factors, including overtopping or sudden failures of levees, which can result in deep and rapid flooding with little warning. In addition, urban development in flood-prone areas has exposed the public to the risk of flooding.

Hydropower

Although California is the most energy-efficient state per capita in the nation, demands for electricity are growing at a rapid pace. According to the California Energy Commission's *2012 Integrated Energy Policy Report Update*, over the next 10 years, California's peak demand for electricity is expected to increase at a rate of approximately 1.5 percent per year through 2022, from about 60,000

megawatts (MW) in 2011 to about 70,000 MW by 2022. Executive Orders S-14-08 and S-21-09, issued in 2008 and 2009, respectively, established a goal of using renewable energy sources, including hydropower, for 33 percent of the State's energy consumption by 2020. To implement recent California renewable resources mandates, significant increases in non-dispatchable intermittent renewable resources, such as wind and solar generation, will need to be added to California's power system. This means that other significant flexible generation resources, such as hydropower, will be needed to support and integrate renewable generation. Adding to the need for additional energy sources, existing nuclear power plants are nearing the end of their design lives and some may be offline within the next 10 to 20 years.

Recreation

As California's population continues to grow, demands will increase substantially for recreation opportunities at and near the lakes, reservoirs, streams, and rivers of the Central Valley. Further increases in demand, accompanied by relatively static recreation resources, will cause issues at existing recreation areas. These challenges will be especially pronounced at Shasta Lake, which is one of the most visited recreation destinations in the State and in the region. Even under current levels of demand, USFS, which manages recreation at Shasta Lake, has expressed concern about seasonal access and capacity problems at existing marinas and USFS facilities. A substantial and increasing need exists to improve recreation-related facilities and conditions at Shasta Lake.

Water Quality

The Sacramento River and the Delta support fish and wildlife while providing water supplies for urban, agricultural, and environmental uses across the State. Saltwater intrusion, municipal discharges, agricultural drainage, and water project flows and diversions have led to water quality issues within the Delta, particularly related to salinity. In the Sacramento River, urban and agricultural runoff, and runoff and seepage from abandoned mining operations, have resulted in elevated levels of pesticides, phosphorous, mercury, and other metals. Additional operational flexibility could provide opportunities to improve Sacramento River and Delta water quality conditions.

S.5 Study Area

Present Shasta Dam

Shasta Dam and Shasta Lake are located on the upper Sacramento River in Northern California, approximately 9 miles northwest of Redding in Shasta County. Because of the potential influence of the proposed modification of Shasta Dam and subsequent system operations and water deliveries on resources over a large geographic area, the SLWRI includes both a primary study area and an extended study area. As shown in Figure S-2, the primary study area includes Shasta Dam and Lake; the lower portions of all contributing major and minor tributaries flowing into Shasta Lake; Trinity and Lewiston reservoirs; and the Sacramento River between Shasta Dam and the RBPP, including tributaries at their confluence. The extended study area includes the Sacramento River downstream from the RBPP, including portions of the American and Feather river basins downstream from CVP/SWP reservoirs and related facilities; the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta); lower portions of the San Joaquin River basin downstream from CVP reservoirs and related facilities (Friant and New Melones reservoirs); and CVP and SWP facilities and water service areas (shown in Figure S-3).

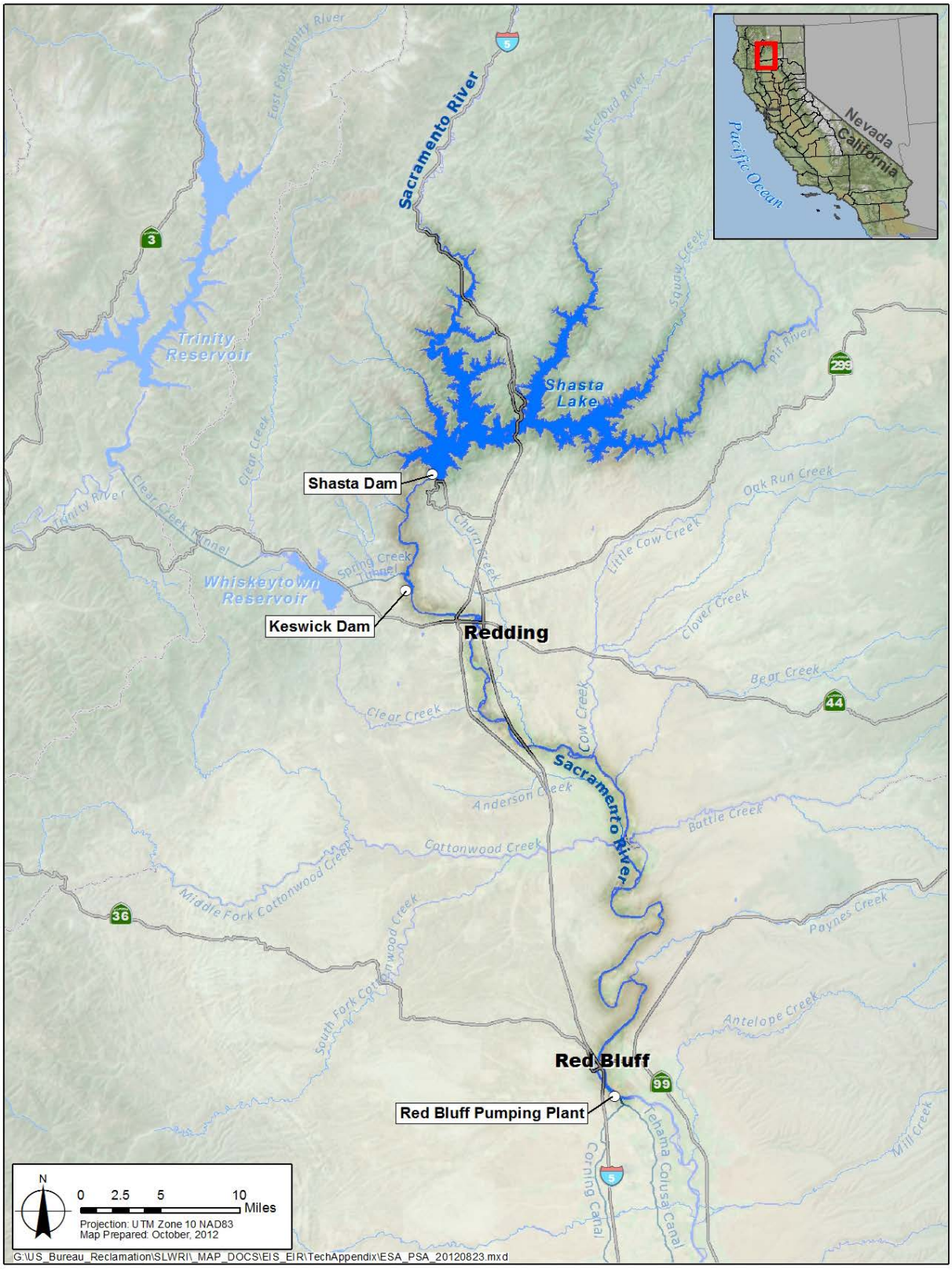


Figure S-2. Primary Study Area – Shasta Lake Area and Sacramento River from Shasta Dam to Red Bluff Pumping Plant

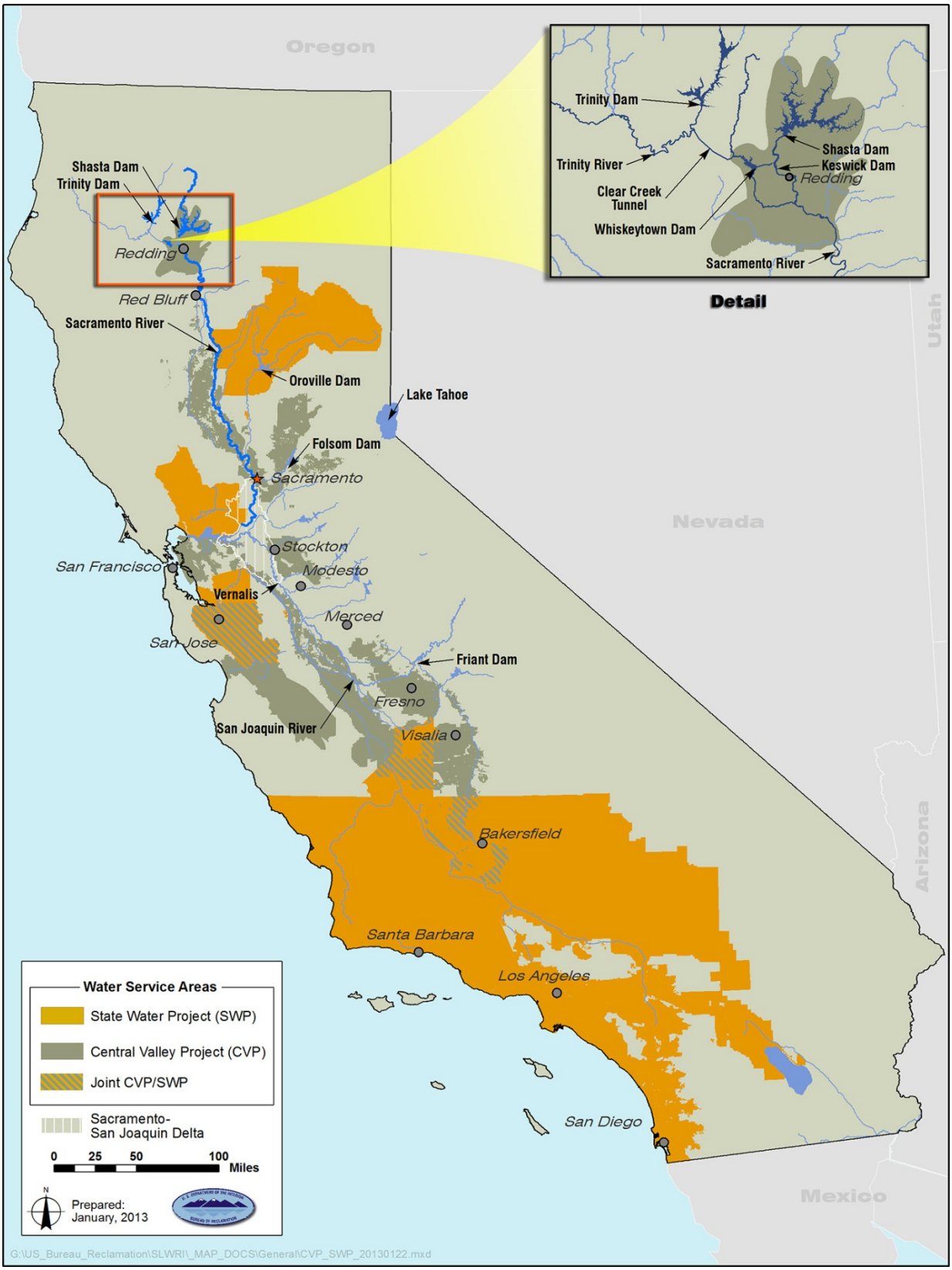


Figure S-3. Central Valley Project and State Water Project Facilities and Water Service Areas

S.6 Summary Description of Alternatives

Consistent with NEPA and the P&G, the plan formulation process for the SLWRI was divided into multiple phases, as shown in Figure S-4. Through this process, comprehensive plans (i.e., action alternatives) were formulated in addition to a No-Action Alternative. Each of the comprehensive plans includes enlarging Shasta Dam and Reservoir and a variety of management measures to address, in varying degrees, all of the project objectives. All of the comprehensive plans include eight common management measures:

- **Enlarge Shasta Lake cold-water pool** – All action alternatives would involve enlarging the cold-water pool by raising Shasta Dam to enlarge Shasta Reservoir.

- **Modify temperature control device** – Minimum modifications to the TCD under all action alternatives would include raising the existing structure and modifying the shutter control.

- **Increase conservation storage** – All action alternatives would increase the conservation storage in Shasta Reservoir by raising Shasta Dam.

- **Reduce demand** – All action alternatives would include a water conservation program for increased water deliveries that would be created by the project to augment current water use efficiency practices.

- **Modify flood operations** – Enlarging Shasta Reservoir would require adjustment of the existing flood operation guidelines, or rule curves, to reflect physical modifications, such as an increase in dam/spillway elevation; the rule curves would be revised with the goal of reducing flood damage and enhancing other objectives to the extent possible.

- **Modify hydropower facilities** – Enlarging Shasta Dam would require various modifications to the dam's existing hydropower facilities to enable their continued efficient use.

- **Maintain and increase recreation opportunities** – Recreation is important to the Shasta Lake region; therefore, existing recreation opportunities would be maintained and/or increased under all action alternatives.

- **Maintain or improve water quality** – All action alternatives would maintain and potentially improve water quality by increasing Delta outflow during drought years and reducing salinity during critical periods, and may also provide additional operational flexibility for responses to Delta emergencies.

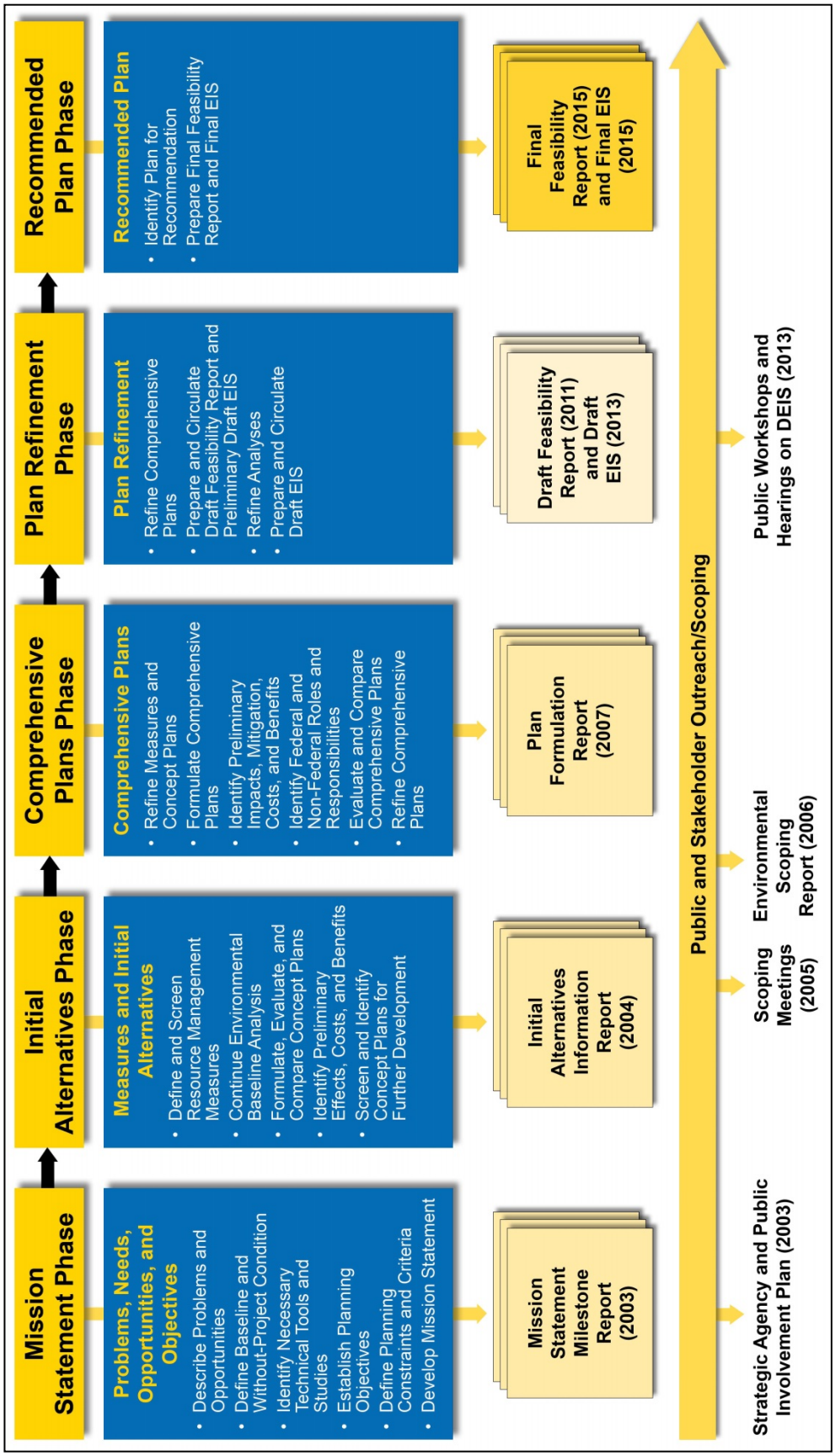


Figure S-4. Plan Formulation Phases

In addition, Reclamation has incorporated environmental commitments into each of the comprehensive plans to avoid or minimize potential impacts. Each comprehensive plan also includes mitigation measures where feasible to avoid, minimize, rectify, reduce, or compensate for significant and potentially significant impacts.

The No-Action Alternative and the comprehensive plans are summarized below.

S.6.1 No-Action Alternative

For the SLWRI, under the No-Action Alternative, the Federal Government would continue to implement reasonably foreseeable actions, including actions with current authorization, secured funding for design and construction, and environmental permitting and compliance activities that are substantially complete. However, the Federal Government would not take additional actions toward implementing a plan to raise Shasta Dam to help increase anadromous fish survival in the upper Sacramento River, nor help address the growing water supply and reliability issues in California. The following discussions highlight the consequences of implementing the No-Action Alternative, as they relate to project objectives.

Anadromous Fish Survival

Much has been done to address anadromous fish survival problems in the upper Sacramento River. Solutions have ranged from changes in the timing and magnitude of releases from Shasta Dam to constructing and operating the TCD at the dam. Actions also include site-specific projects, such as introducing spawning gravel to the Sacramento River, and work to improve or restore spawning habitat in tributary streams. However, to increase anadromous fish survival and reduce the risk of extinction, further water temperatures improvements are needed in the Sacramento River, especially in dry and critical years. According to the NMFS 2014 *Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead,* prolonged drought that depletes the cold-water pool in Shasta Reservoir could place populations of anadromous fish at risk of severe population decline or extirpation in the long-term. Under the No-Action Alternative, it is assumed that actions to protect fisheries and benefit aquatic environments would continue, including maintaining the TCD, ongoing spawning gravel augmentation programs, and satisfying other existing regulatory requirements.

Water Supply Reliability

Demands for water in California will continue to exceed available supplies, and the need for additional supplies is expected to grow. Competition for available water supplies would intensify as water demands increase to support population growth. Water conservation and reuse efforts are expected to substantially increase, and forced conservation as the result of increasing water shortages would continue. It is likely that with continued and deepening shortages in

available water supplies, adverse economic and socioeconomic impacts would increase over time in the Central Valley and elsewhere in California.

Ecosystem Resources, Flood Management, Hydropower, Recreation, and Water Quality

Under the No-Action Alternative, the Federal Government would continue to implement reasonably foreseeable actions, but would not take additional actions to help restore ecosystem resources, develop additional hydropower generation, reduce flood damage, increase recreation opportunities at Shasta Lake, or improve water quality in the Sacramento River and the Delta. This would result in the following conditions:

- As opportunities arise, some efforts would likely continue to improve environmental conditions on tributaries to Shasta Lake and along the upper Sacramento River. However, overall, future environmental-related conditions in these areas would likely be similar to existing conditions.

- The threat of flooding would continue, and may increase as population growth continues.

- California's demand for electricity is expected to increase substantially in the future. No actions would be taken to help meet this growing demand.

- As California's population continues to grow, demands would grow substantially for water-oriented recreation at and near the lakes, reservoirs, streams, and rivers of the Central Valley. This increase in demand would be especially pronounced at Shasta Lake.

- To address the impact of water quality deterioration on the Sacramento River basin and Delta ecosystems, several environmental flow goals have been established through legal mandates. Despite these efforts, these resources would continue to decline and ecosystems would continue to be impacted.

S.6.2 Comprehensive Plan 1 (CP1) – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

CP1	
Dam Raise	*6.5 feet*
Increased Storage	*256,000 acre-feet*
Focus	*Anadromous Fish Survival & Water Supply Reliability*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Environmental Commitments & Mitigation Measures

CP1 focuses on both anadromous fish survival and water supply reliability. This alternative primarily consists of enlarging Shasta Dam by raising the crest 6.5 feet and implementing the set of eight common management measures described above. CP1 also includes implementing environmental commitments and mitigation measures. By raising Shasta Dam from a crest at elevation 1,077.5 feet above mean sea level (elevation 1,077.5) to elevation 1,084.0 (based on the National Geodetic Vertical Datum 1929 (NGVD29)),[2] in combination with spillway modifications, this alternative would increase the height of the reservoir's full pool by 8.5 feet. This increase in full pool height would add approximately 256,000 acre-feet of additional storage to the overall reservoir capacity. Accordingly, the overall full pool storage would increase from 4.55 MAF to 4.81 MAF.

Under CP1, the additional storage in Shasta Reservoir would be used to increase water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. Enlarging Shasta Reservoir would increase the depth and volume of the cold-water pool, increasing the ability of Reclamation to release cold water from Shasta Dam and regulate seasonal water temperatures for fish in the upper Sacramento River during critical periods. This alternative (and all action alternatives) includes extending the existing TCD for efficient use of the expanded cold-water pool. CP1 would increase water supply reliability for agricultural, M&I, and environmental purposes. CP1 would also help reduce future water shortages through increasing irrigation and M&I deliveries, primarily during drought periods.

CP1 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP1 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental

[2] Dam crest elevations are based on NGVD29. All current feasibility-level designs and figures for Shasta Dam and appurtenant structures are based on NGVD29.

increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP1, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. In dry years, 70,000 acre-feet of the 256,000 acre-feet increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. In critical years, 35,000 acre-feet of the increased storage capacity would be reserved for increasing M&I deliveries.

S.6.3 Comprehensive Plan 2 (CP2) – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

CP2 focuses on both anadromous fish survival and water supply reliability. This alternative primarily consists of enlarging Shasta Dam by raising the crest 12.5 feet and implementing the set of eight common management measures described above. CP2 also includes implementing environmental commitments and mitigation measures. A dam raise of 12.5 feet was chosen because it represents a midpoint between the likely smallest dam raise considered and the largest practical dam raise that would not require relocating the Pit River Bridge. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,090.0 (NGVD29), in combination with spillway modifications, CP2 would increase the height of the reservoir's full pool by 14.5 feet. This increase in full pool height would add approximately 443,000 acre-feet of storage to the reservoir's capacity. Accordingly, storage in the overall full pool would increase from 4.55 MAF to 5.0 MAF.

CP2	
Dam Raise	*12.5 feet*
Increased Storage	*443,000 acre-feet*
Focus	*Anadromous Fish Survival & Water Supply Reliability*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Environmental Commitments & Mitigation Measures

Under CP2, the additional storage in Shasta Reservoir would be used to increase water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. CP2 would increase the ability of Shasta Dam to regulate seasonal water temperatures for fish, primarily during critical periods, and would increase water supply reliability for agricultural, M&I, and

environmental purposes. CP2 would also help reduce future water shortages through increasing irrigation and M&I deliveries, primarily during drought periods.

CP2 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP2 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP2, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. In dry years, 120,000 acre-feet of the 443,000 acre-feet increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. In critical years, 60,000 acre-feet of the increased storage capacity would be reserved for increasing M&I deliveries.

S.6.4 Comprehensive Plan (CP3) – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival

CP3 focuses on both agricultural water supply reliability and anadromous fish survival. This alternative primarily consists of enlarging Shasta Dam and Reservoir by raising the dam crest 18.5 feet and implementing the set of eight common management measures described above. CP3 also includes implementing environmental commitments and mitigation measures.

CP3	
Dam Raise	*18.5 feet*
Increased Storage	*634,000 acre-feet*
Focus	*Agricultural Water Supply Reliability & Anadromous Fish Survival*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Environmental Commitments & Mitigation Measures

By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0 (NGVD29), in combination with spillway modifications, CP3 would increase the height of the reservoir's full pool by 20.5 feet. This increase in full pool height would add approximately 634,000 acre-feet of storage to the reservoir's capacity. Accordingly, storage in the overall full pool would be increased from 4.55 MAF to 5.19 MAF. Although higher dam raises are technically and physically feasible, 18.5 feet is the largest dam raise that would not require extensive and costly reservoir area relocations, such as relocating the Pit River Bridge, Interstate 5, and the Union Pacific Railroad tunnels.

Because CP3 focuses on increasing agricultural water supply reliability and anadromous fish survival, none of the increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations. The additional storage would be retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. CP3 would increase the ability of Shasta Dam to regulate seasonal water temperatures for fish, primarily during critical periods, and would increase water supply reliability for agricultural, M&I, and environmental purposes. CP3 would also help reduce future water shortages through increasing irrigation deliveries.

CP3 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP3 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of

recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP3, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

S.6.5 Comprehensive Plan 4 (CP4) and Comprehensive Plan 4A (CP4A) – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

CP4 and CP4A focus on increasing anadromous fish survival, while also increasing water supply reliability. CP4 and CP4A are identical except for Shasta Dam and reservoir operations. CP4 and CP4A have similar reservoir operations in that they each dedicate a portion of the new storage in Shasta Lake for fisheries purposes; however, the portion of this dedicated storage varies.

CP4 and CP4A	
Dam Raise	*18.5 feet*
Increased Storage	*634,000 acre-feet*
Focus	*Anadromous Fish Survival with Water Supply Reliability*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Adaptive Management *CP4 –Reserving 378,000 acre-feet of Storage for Cold-Water Pool* *CP4A – Reserving 191,000 acre-feet of Storage for Cold-Water Pool*
	Augment Spawning Gravel
	Restore Riparian, Floodplain, & Side Channel Habitat
	Environmental Commitments & Mitigation Measures

These alternatives primarily consist of enlarging Shasta Dam and Reservoir by raising the dam crest 18.5 feet and implementing the set of eight common management measures described above. CP4 and CP4A also include implementing environmental commitments and mitigations measures. In addition, CP4 and CP4A would dedicate a portion of the increased storage in Shasta Reservoir for maintaining cold-water volumes to benefit anadromous fish in the upper Sacramento River. CP4 and CP4A also include two additional ecosystem restoration features: (1) augmenting spawning gravel in the upper Sacramento River at targeted locations to provide either immediate spawning habitat or long-term recruitment, and (2) restoring riparian, floodplain, and side channel habitat in the upper Sacramento River to provide rearing habitat for juvenile salmonids.

The additional storage created by the 18.5-foot dam raise would be used to improve the ability to meet water temperature objectives and habitat

requirements for anadromous fish during drought years and increase water supply reliability. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0 (NGVD29), in combination with spillway modifications, CP4 and CP4A would increase the overall full pool storage from 4.55 MAF to 5.19 MAF. Of the increased reservoir storage space, about 378,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes in CP4; 191,000 acre-feet would be dedicated in CP4A. Operations of the cold-water pool would be subject to an adaptive management plan that may include operational changes to the timing and magnitude of release from Shasta Dam to benefit anadromous fish. For CP4, operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as for CP1, with 70,000 acre-feet reserved in dry years and 35,000 acre-feet reserved in critical years to specifically focus on increasing M&I deliveries. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2, with 120,000 acre-feet reserved in dry years and 60,000 acre-feet reserved in critical years to specifically focus on increasing M&I deliveries.

CP4 and CP4A also address secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP4 and CP4A include features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP4 and CP4A, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

S.6.6 Comprehensive Plan 5 (CP5) – 18.5-Foot Dam Raise, Combination Plan

CP5	
Dam Raise	*18.5 feet*
Increased Storage	*634,000 acre-feet*
Focus	*Water Supply Reliability, Anadromous Fish Survival, Ecosystem Restoration, and Recreation*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Construct Resident Fish Habitat at Shasta Lake & along Tributaries
	Augment Spawning Gravel
	Restore Riparian, Floodplain, & Side Channel Habitat
	Increase Recreation Opportunities
	Environmental Commitments & Mitigation Measures

CP5 focuses on anadromous fish survival, increased water supply reliability, ecosystem enhancements in the Shasta Lake area and the upper Sacramento River upstream from the RBPP, and increased recreation opportunities around Shasta Lake. This alternative primarily consists of raising Shasta Dam 18.5 feet; implementing the set of eight common management measures described above; constructing additional resident fish habitat in Shasta Lake and along the lower reaches of its tributaries (the Sacramento River, the McCloud River, and Squaw Creek); constructing shoreline fish habitat around Shasta Lake; augmenting spawning gravel in the upper Sacramento River; restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake. CP5 also includes implementing environmental commitments and mitigations measures. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0 (NGVD29), in combination with spillway modifications, CP5 would increase the height of the reservoir's full pool by 20.5 feet, increasing the overall full pool storage from 4.55 MAF to 5.19 MAF.

Under CP5, the additional storage in Shasta Reservoir would be used to increase water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. Enlarging Shasta Reservoir would increase the depth and volume of the cold-water pool, increasing the ability of Reclamation to release cold water from Shasta Dam and regulate seasonal water temperatures for fish in the upper Sacramento River during critical periods. This alternative (and all action alternatives) includes extending the existing TCD for efficient use of the expanded cold-water pool. CP5 would increase water supply reliability for agricultural, M&I, and environmental purposes. CP5 would also help reduce future water shortages through increasing irrigation and M&I deliveries, primarily during drought periods.

CP5 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an

increase in power generation. CP5 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP5, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. In dry years, 150,000 acre-feet of the 634,000 acre-feet increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. In critical years, 75,000 acre-feet of the increased storage capacity would be reserved for increasing M&I deliveries.

S.6.7 Summary of Comprehensive Plan Physical Features and Benefits

The following sections describe the physical features and potential benefits of comprehensive plans (action alternatives) evaluated in this EIS.

Physical Features

Each of the comprehensive plans (action alternatives) involves raising Shasta Dam by 6.5 feet to 18.5 feet, increasing the storage capacity in Shasta Reservoir by 256,000 acre-feet to 634,000 acre-feet, and constructing a common set of features, as shown in Table S-1. Features and related construction activities under all comprehensive plans would include the following:

- Clearing vegetation from portions of the inundated reservoir area
- Constructing the dam, appurtenant structures, reservoir area dikes, and railroad embankments
- Relocating roadways, bridges, recreation facilities, utilities, and miscellaneous minor infrastructure

Table S-1. Summary of Physical Features of Action Alternatives

	Action Alternatives					
Main Features	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Dam and Appurtenant Structures						
Shasta Dam						
Crest Raise (feet)	6.5	12.5	18.5	18.5	18.5	18.5
Full Pool Height Increase (feet)	8.5	14.5	20.5	20.5	20.5	20.5
Elevation of Dam Crest (feet)[1]	1084.0	1090.0	1096.0	1096.0	1096.0	1096.0
Elevation of Full Pool (feet)[2]	1,078.2	1,084.2	1,090.2	1,090.2	1,090.2	1,090.2
Capacity Increase (acre-feet)	256,000	443,000	634,000	634,000	634,000	634,000
Main Dam	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.
Wing Dams	Raise to meet dam crest. Build new visitor center along left wing dam. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Build new visitor center along left wing dam. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Build new visitor center along left wing dam. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Build new visitor center along left wing dam. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Build new visitor center along left wing dam. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Build new visitor center along left wing dam. Relocate gantry crane on right wing dam.
Spillway	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.
River Outlets	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.
Temperature Control Device	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.
Shasta Powerplant/ Penstocks	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.
Pit 7 Dam/Powerhouse	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.

Table S-1. Summary of Physical Features of Action Alternatives (contd.)

Main Features	Action Alternatives CP1	CP2	CP3	CP4	CP4A	CP5
Reservoir Area Clearing	Clear 150 acres completely and 220 acres with overstory removal.	Clear 240 acres completely and 350 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.
Reservoir Area Dikes and Railroad Embankments	Construct 3 railroad embankments and 2 new dikes.	Construct 3 railroad embankments and 3 new d kes.	Construct 3 railroad embankments and 4 new dikes.	Construct 3 railroad embankments and 4 new dikes.	Construct 3 railroad embankments and 4 new dikes.	Construct 3 railroad embankments and 4 new d kes.
Relocations						
Roadways	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.
Length of Relocated Roadway (linear feet)	16,700	28,400	33,100	33,100	33,100	33,100
Number of Road Segments Affected	10	21	30	30	30	30
Vehicle Bridges	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.
Railroad	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge
Recreation Facilities	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 202 campsites/day-use sites/RV sites, 2 USFS facilities, 8.1 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 261 campsites/ day-use sites/RV sites, 2 USFS facilities, 9.9 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads. Add 6 trailheads and 18 miles of new hiking trails.
Utilities	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.

Table S-1. Summary of Physical Features of Action Alternatives (contd.)

Action Alternatives						
Main Features	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Ecosystem Enhancements	None	None	None	Reserve 378 TAF of the additional storage for cold-water supply for anadromous fish. Implement adaptive management plan to benefit anadromous fish. Augment spawning gravel in the upper Sacramento River at the rate of up to 10,000 tons per year. Restore riparian, floodplain, and side channel habitat along the upper Sacramento River.	Reserve 191 TAF of the additional storage for cold-water supply for anadromous fish. Implement adaptive management plan to benefit anadromous fish. Augment spawning gravel in the upper Sacramento River at the rate of up to 10,000 tons per year. Restore riparian, floodplain, and side channel habitat along the upper Sacramento River.	Construct shoreline fish habitat around Shasta Lake. Enhance aquatic habitat in tributaries to Shasta Lake to improve fish passage. Augment spawning gravel in the upper Sacramento River at the rate of up to 10,000 tons per year. Restore riparian, floodplain, and side channel habitat along the upper Sacramento River.

Notes:
[1] Dam crest elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD29). All current feasibility-level designs and figures for Shasta Dam and appurtenant structures are based on NGVD29.
[2] Full pool elevations are based on the North American Vertical Datum of 1988 (NAVD88), which is 2.66 feet higher than NGVD29. All current feas bility-level designs and figures for reservoir area infrastructure modifications and relocations to accommodate increased water levels are based on a 2001 aerial survey of the reservoir using NAVD88.

Key:
CP = comprehensive plan
RV = recreational vehicle
TAF = thousand acre-feet
USFS = U.S. Department of Agriculture, Forest Service

CP4, CP4A, and CP5 would also include features and related construction activities associated with gravel augmentation and restoring riparian, floodplain, and side channel habitat along the upper Sacramento River. Additional features and related construction activities associated with Shasta Lake and tributary shoreline enhancements and features to increase Shasta Lake recreation opportunities are included under CP5. Figure S-5 illustrates major features in the Shasta Lake area common to all comprehensive plans.

Benefits

For all of the comprehensive plans, the additional storage would be used to increase the ability of Reclamation to regulate water temperatures for anadromous fish and increase water supply reliability, primarily in drought periods. Table S-2 summarizes the potential benefits for each project objective for each comprehensive plan. As shown in Table S-2, each of the comprehensive plans would contribute in varying degrees to all of the primary and secondary planning objectives.

S.7 Alternatives Considered and Eliminated

Formulation of a range of alternatives for evaluation in this feasibility study began with a review of problems, needs, and opportunities identified and defined previously, study authorities, and other pertinent direction, followed by development of primary and secondary planning objectives, and, finally, development of comprehensive plans (action alternatives) to meet the project purpose and need. Some project alternatives suggested during this process (e.g., raising Shasta Dam by up to 200 feet) were not retained because they did not adequately meet, or were beyond the scope of, the purpose and need statement, did not contribute to both primary planning objectives, had extremely high costs, had high social or environmental impacts, or were previously analyzed in or rejected from consideration by the CALFED agencies in the CALFED PEIS/R.

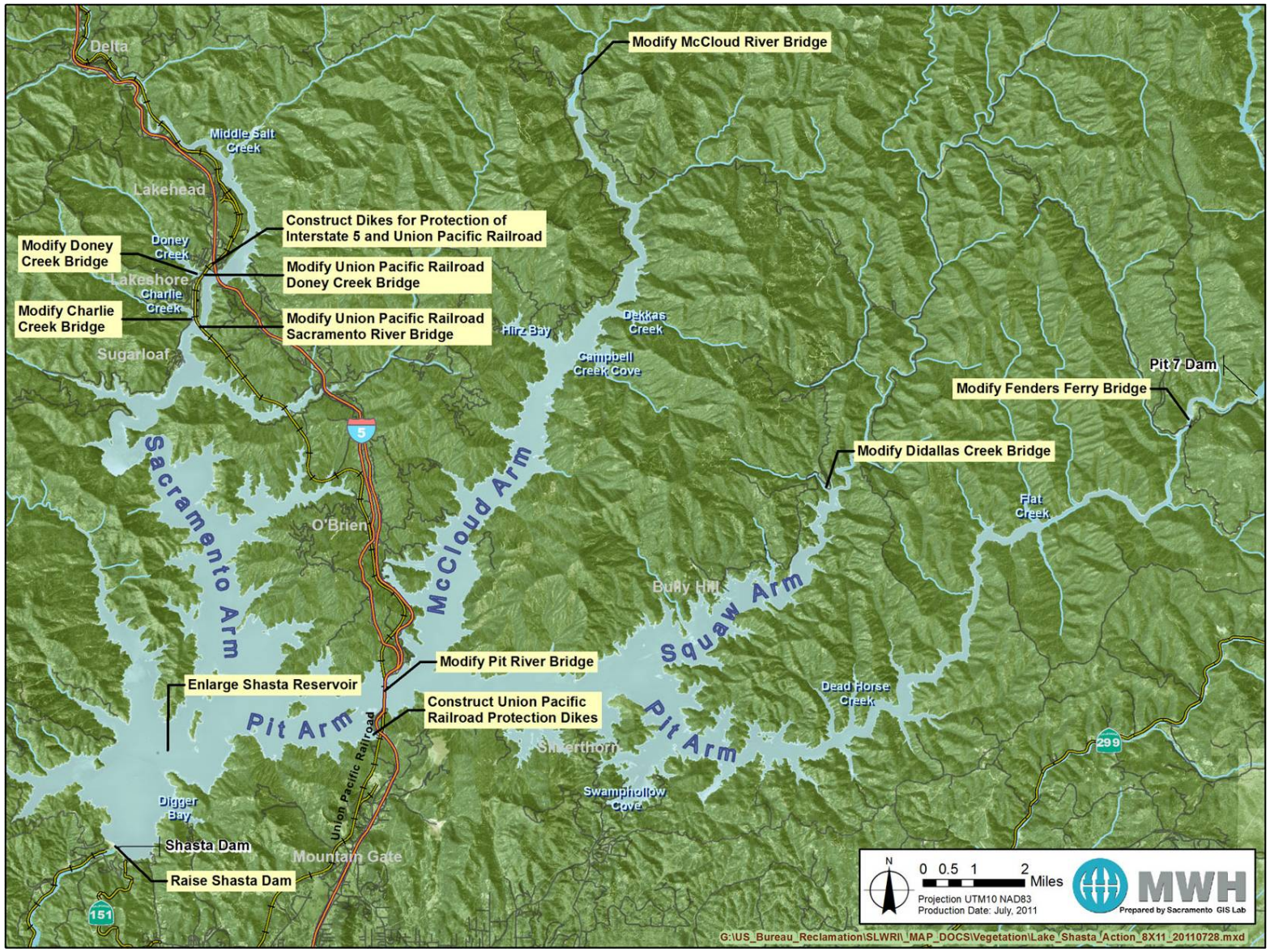


Figure S-5. Major Features Common to All Action Alternatives

Table S-2. Summary of Major Potential Benefits of Action Alternatives

Item	CP1	CP2	CP3	CP4	CP4A	CP5
Shasta Dam Raise (feet)	**6.5**	**12.5**	**18.5**	**18.5**	**18.5**	**18.5**
Total Increased Storage (TAF)	256	443	634	634	634	634
Benefits Related to Project Objectives						
Increase Anadromous Fish Survival						
Dedicated Storage (TAF)	-	-	-	378	191	-
Production Increase (thousand fish)[1]	61	379	207	813	710	378
Spawning Gravel Augmentation (tons)[2]				10,000	10,000	10,000
Side Channel Rearing Habitat Restoration				Yes	Yes	Yes
Increase Water Supply Reliability						
Total Increased Dry and Critical Year Water Supplies (TAF/year)[3]	47.3	77.8	63.1	47.3	77.8	113.5
Increased NOD Dry and Critical Year Water Supplies (TAF/year)[3]	4.5	10.7	35.2	4.5	10.7	25.2
Increased SOD Dry and Critical Year Water Supplies (TAF/year)[3]	42.7	67.1	28.0	42.7	67.1	88.3
Increased Water Use Efficiency Funding	Yes	Yes	Yes	Yes	Yes	Yes
Increased Emergency Water Supply Response Capability	Yes	Yes	Yes	Yes	Yes	Yes
Reduce Flood Damage						
Increased Reservoir Storage Capacity	Yes	Yes	Yes	Yes	Yes	Yes
Additional Hydropower Generation[4]						
Increased Hydropower Generation (GWh/year)[5]	52 - 54	87 - 90	86 - 90	127 - 133	125 - 130	112 - 117
Conserve, Restore, and Enhance Ecosystem Resources						
Shoreline Enhancement (acres)	-	-	-	-	-	130
Tributary Aquatic Habitat Enhancement (miles)[6]	-	-	-	-	-	6
Riparian, Floodplain, and Side Channel Restoration Habitat	-	-	-	Yes	Yes	Yes
Increased Ability to Meet Flow and Temperature Requirements Along Upper Sacramento River	Yes	Yes	Yes	Yes	Yes	Yes
Improve Water Quality						
Improved Delta Water Quality	Yes	Yes	Yes	Yes	Yes	Yes
Increased Delta Emergency Response Capability	Yes	Yes	Yes	Yes	Yes	Yes
Increase Recreation						
Recreation (user days, thousands)[7]	85 - 89	116 - 134	201 - 205	307 - 370	246 - 259	142 - 175
Modernization of Recreation Facilities	Yes	Yes	Yes	Yes	Yes	Yes

Table S-2. Summary of Major Potential Benefits of Action Alternatives (contd.)

Notes:

[1] Numbers were derived from SALMOD and represent an index of production increase, based on the estimated average annual increase in juvenile Chinook salmon surviving to migrate downstream from Red Bluff Pumping Plant.

[2] Average amount per year for 10-year period.

[3] Total drought period reliability for Central Valley Project and State Water Project deliveries. Does not reflect benefits related to water use efficiency actions included in all comprehensive plans.

[4] In addition to increased hydropower generation, all comprehensive plans provide increased capacity benefits (i.e., the rate at which power can be generated) and ancillary services, which provide the ability to manage the electric grid in a reliable manner.

[5] Annual increased in hydropower generation were estimated using two methodologies – at load center (accounting from transmission losses) and at-plant (no transmission losses). To provide a more conservation estimate of potential hydropower benefits, load center generation values were used to estimate potential benefits of increased hydropower generation under comprehensive plans. However, increased generation values reported in Chapter 23, "Power and Energy," of this EIS are based on at-plant generation values to capture the largest potential effects from changes in hydropower generation and pumping.

[6] Tributary aquatic enhancement provides for the connectivity of native fish species and other aquatic organisms between Shasta Lake and its tributaries. Estimates of benefits reflect only connectivity with perennial streams and do not reflect additional miles of connectivity with intermittent streams.

[7] Annual recreation visitor user days were estimated using two methodologies. The minimum user day value was used to estimate potential recreation benefits to provide a more conservative estimate of the potential benefits of increased recreation under comprehensive plans. However, the maximum user value was used for direct and indirect effects evaluations in each resource area chapter to capture the largest potential effects from increased visitation. These values do not account for increased visitation due to modernization of recreation facilities associated with all comprehensive plans. For more detailed information related to estimated recreation user days, please see Chapter 10, "Recreational Visitation," of the Modeling Appendix.

Key:

- = not applicable
CP = comprehensive plan
Delta = Sacramento-San Joaquin Delta
GWh/year = gigawatt-hours per year
NOD = north of Delta
SOD = south of Delta
TAF = thousand acre feet

S.8 Preferred Alternative and Rationale for Selection

A plan recommending Federal action should be the plan that best addresses the targeted water resources problems considering public benefits relative to costs. It is recognized that most of the activities pursued by the Federal Government will require assessing trade-offs by decision makers and that in many cases, the final decision will require judgment regarding the appropriate extent of monetized and nonmonetized effects.

NEPA CEQ Regulations require the identification of the alternative or alternatives that are environmentally preferable in the ROD (40 CFR 1505.2(b)). The environmentally preferable alternative generally refers to the alternative that would result in the fewest adverse effects to the biological and physical environment. It is also the alternative that would best protect, preserve, and enhance historic, cultural, and natural resources. Although this environmentally preferable alternative must be identified in the ROD, it need not be selected for implementation. For the purposes of NEPA, an environmentally preferable alternative will be identified in the ROD associated with this EIS.

The preferred alternative has been identified in the Final EIS in consideration of public, stakeholder, and agency comments on the DEIS. The alternative recommended for implementation may or may not be identified as the "Environmentally Preferable Alternative" consistent with NEPA, the "Least

Environmentally Damaging Practicable Alternative" consistent with the Clean Water Act, and the "Environmentally Superior Alternative" consistent with CEQA.

Consistent with the above CEQ Regulations and NEPA guidelines, the preferred alternative for implementation has been identified in the Final EIS, as described in the following section.

S.8.1 Preferred Alternative

Each of the action alternatives – CP1, CP2, CP3, CP4, CP4A, and CP5 – includes enlarging Shasta Dam and Reservoir and a variety of management measures to address, in varying degrees, all of the project objectives. The major benefits of the action alternatives are summarized in Table S-2, and the impacts and mitigation measures are summarized in Table S-3. The cost estimates are presented in the Engineering Summary Appendix, Attachment 1, "Cost Estimates for Comprehensive Plans."

In the action alternatives, dam raises of three different heights were evaluated – 6.5 feet, 12.5 feet, and 18.5 feet. While all action alternatives provide benefits for the identified primary and secondary project objectives (to varying degrees), the overall benefits of an 18.5-foot raise (CP3, CP4, CP4A, or CP5) were found to be greater than those of either a 6.5-foot raise (CP1) or 12.5-foot raise (CP2). Therefore, only the 18.5-foot raise action alternatives were retained as possibilities for the preferred alternative. For example, the additional reservoir storage would increase from 256,000 acre-feet with the 6.5-foot raise to 634,000 acre-feet with the 18.5-foot raise – nearly 2.5 times the additional reservoir storage of the 6.5-foot raise for between 15-25 percent greater construction costs. This additional reservoir storage space would support both water supply reliability and fisheries objectives.

Reservoir operations and the resulting benefits were the differentiators amongst the 18.5-foot raise action alternatives (CP3, CP4, CP4A, or CP5). For example, CP3 would maximize agricultural water supply reliability, but would be the least beneficial to fisheries of the 18.5-foot raises. CP4 would provide the best opportunity to address anadromous fish survival in the upper Sacramento River; however, CP4 would provide the lowest benefits to water supply reliability.

Below is a summary of each action alternative weighed by Reclamation during the selection of a preferred alternative.

- CP1, formulated to address both anadromous fish survival and water supply reliability, would result in the lowest benefits of all of the action alternatives. Greater project benefits should be realized with higher dam raises for relatively low increases in costs. Therefore, CP1 was not selected as the preferred alternative.

- CP2, formulated to address both anadromous fish survival and water supply reliability, would have relatively low benefits when compared to the other action alternatives. Greater project benefits should be realized with higher dam raises for relatively low increases in costs. Therefore, CP2 was not selected as the preferred alternative.

- CP3, formulated to address both agricultural water supply reliability and anadromous fish survival, would greatly increase agricultural water supply reliability. However, CP3 would have no M&I water supply benefits and very low anadromous fish survival benefits when compared to the other 18.5-foot raises. Therefore, CP3 was not selected as the preferred alternative.

- CP5, formulated as a combination plan focusing on all objectives, would greatly increase water supply reliability. However, CP5 would have relatively low increased anadromous fish survival benefits in comparison with all other 18.5-foot raises. Therefore, CP5 was not selected as the preferred alternative.

- CP4, formulated to focus on anadromous fish survival while increasing water supply reliability, would have the highest increase in anadromous fish survival of all of the alternatives and the lowest increase in water supply reliability compared to all of the considered alternatives (equal to CP1). CP4 would not best meet both of the primary objectives; water supply reliability would be compromised for increased anadromous fish survival. Therefore, CP4 was not selected as the preferred alternative. However, the evaluation of CP4 did indicate that refinements of operations could be made to optimize the amount of water supply targeted for anadromous fish survival and water supply reliability such that both primary objectives could be substantially achieved with an 18.5-foot raise. This evaluation provided the impetus for Reclamation to develop CP4A, which performs better at simultaneously meeting both the anadromous fish survival and water reliability primary objectives.

CP4A would best balance and meet both of the primary objectives. CP4A, formulated to address both anadromous fish survival and water supply reliability, would have relatively high increases in water supply reliability (equal to CP2) and the second highest increase in anadromous fish survival of all of the alternatives. CP4A would have the ability to meet the secondary project objectives, which were considered to the extent possible through pursuit of the primary project objectives. Secondary objectives include ecosystem enhancement, flood damage reduction, improved Delta water quality, increased hydropower generation and increased recreation. As an 18.5-foot raise, CP4A would best maximize benefits relative to costs. For these reasons, CP4A is the preferred alternative.

S.9 Major Conclusions of Environmental Analysis

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

S.9.1 Methods and Assumptions

This EIS analyzes the direct and indirect effects of the No-Action Alternative and action alternatives for each environmental resource area. Direct effects are those that would be caused by the action and would occur at the same time and place. Indirect effects are reasonably foreseeable consequences that may occur at a later time or at a distance from the project area. Examples of indirect effects are growth inducement and other effects related to changes in land use patterns, population density, or growth rate, and related effects on the physical environment.

The effects of the No-Action Alternative and action alternatives were determined by comparing estimates of resulting conditions with baseline conditions. These baseline conditions differ between NEPA and CEQA. Under NEPA, the No-Action Alternative (i.e., expected future conditions without the project) is the baseline to which the action alternatives are compared; the No-Action Alternative is also compared to existing conditions. Under CEQA, existing conditions are the baseline to which alternatives are compared.

CVP and SWP Operational Assumptions

Reclamation and DWR use CalSim-II, a specific application of the Water Resources Integrated Modeling System (WRIMS) to Central Valley water operations, to study operations, benefits, and effects of new facilities and operational parameters for the CVP and SWP. In this EIS, the quantitative assessment of actions related to water resources relied primarily on two CalSim-II baselines for CEQA and NEPA:

- "Existing cconditions," based on a 2005 level of development and current facilities, as defined in 2012 (a 2005 baseline)

- "Future cconditions," based on without-project forecasted 2020-2030 level of development and reasonably foreseeable future projects and facilities (a 2030 baseline)[3]

Operational assumptions for refinement, modeling, and evaluation of potential effects of the No-Action Alternative and action alternatives included in this EIS were derived from the 2008 Long-Term Operation BA, the 2008 USFWS BO, the 2009 NMFS BO, and the Coordinated Operations Agreement between Reclamation and DWR for the CVP and SWP, as ratified by Congress (Reclamation and DWR 1986).

Despite the uncertainty resulting from ongoing consultation processes, the 2008 Long-Term Operation BA and the 2008 and 2009 BOs issued by the fishery agencies contain the most recent estimate of potential changes in water operations that could occur in the near future. If the revised USFWS and NMFS BOs contain new or amended reasonable and prudent alternatives (RPA), such requirements may result in changes to CVP and SWP operational constraints.

Climate Change

CEQ guidance, issued February 18, 2010, suggests that Federal agencies consider opportunities to reduce greenhouse gas (GHG) emissions caused by proposed Federal actions, adapt their actions to climate change impacts throughout the NEPA process, and address these issues in the agencies' NEPA procedures. Following are the main factors to consider when addressing climate change in environmental documentation:

- Effects of a proposed action and alternative actions on GHG emissions
- Impacts of climate change on a proposed action or alternatives

CEQ notes that "significant" national policy decisions with "substantial" GHG impacts require analysis of their GHG effects. That is, the GHG effects of a Federal agency's proposed action must be analyzed if the action would cause "substantial" annual direct emissions; would implement energy conservation or reduced energy use or GHG emissions; or would promote cleaner, more efficient renewable-energy technologies.

Each resource area analyzed in the EIS evaluates the effects the action alternatives and No-Action Alternative combined with predicted effects of climate change. The ways that the SLWRI could affect GHG production are

[3] The level of development used for future conditions is a composite of multiple land use scenarios developed by DWR and Reclamation. The Sacramento Valley hydrology, which includes the Sacramento and Feather River basins, is based on projected 2020 land use assumptions associated with DWR Bulletin 160-98 (1998) and the San Joaquin Valley hydrology is based on the 2030 land use assumptions developed by Reclamation. Under any 2020 to 2030 level of development scenario, the majority of the CVP and SWP unmet demand is located south of the Delta, including the San Joaquin Valley. Please see Table 2-1 in the Modeling Appendix for additional information on CalSim-II modeling assumptions.

also addressed. The Climate Change Modeling Appendix provides a summary of global climate forecasts and a discussion of the implications of climate change for California water resources. This appendix also includes quantitative analyses of climate change for selected comprehensive plans on resource areas. The discussion of climate change implications provided in the Climate Change Modeling Appendix provides context for consideration of cumulative conditions.

S.9.2 Summary of Impacts

The action alternatives would affect environmental resources in the primary and extended study areas. Some of the impacts would be temporary, construction-related effects that would be less than significant or would be reduced to less-than-significant levels through mitigation. Other impacts would be permanent, some of which would remain significant and unavoidable despite proposed mitigation measures. In addition, some effects of the project would be beneficial. Under CEQA, potentially significant impacts are treated as significant impacts. Therefore, consistent with CEQA, unless feasible mitigation measures have been identified to reduce the magnitude of a significant or potentially significant impact to less than significant, the level of significance after mitigation is considered significant and unavoidable.

Table S-3, included at the end of this Summary, summarizes the environmental impacts of the action alternatives, the duration and quantification of each impact, the level of significance of each impact before mitigation, recommended mitigation measures, and the level of significance of each impact after mitigation.

S.9.3 Significant and Unavoidable Impacts

As shown in Table S-3, after consideration of actions, operations, and features to avoid, mitigate, and/or compensate for adverse effects, the action alternatives would likely result in the following significant and unavoidable direct and indirect impacts:

- **Geology, Geomorphology, Minerals, and Soils** – Loss or diminished availability of known mineral resources that would be of future value to the region; lost or diminished soil biomass productivity; and substantial soil erosion or loss of topsoil due to shoreline processes (all action alternatives).

- **Air Quality and Climate** – Short-term emissions of criteria air pollutants and precursors at Shasta Lake and vicinity during project construction (all action alternatives).

- **Agriculture and Important Farmland** – Direct and indirect conversion of forest land to nonforest uses in the vicinity of Shasta Lake (all action alternatives).

- **Botanical Resources and Wetlands** – Loss of Multi-Species Conservation Strategy covered species; loss of USFS sensitive, U.S. Department of Interior, Bureau of Land Management, sensitive, or California Rare Plant Rank species; loss of jurisdictional waters; and loss of general vegetation habitats (all action alternatives).

- **Wildlife Resources** – Take and loss of habitats for the Shasta salamander, bald eagle, northern spotted owl, and Pacific fisher; impact on the foothill yellow-legged frog, tailed frog, northwestern pond turtle, purple martin, special-status bats, American marten, ringtail, terrestrial mollusks, and their habitat; impact on willow flycatcher, Vaux's swift, yellow warbler, yellow-breasted chat, long-eared owl, northern goshawk, Cooper's hawk, great blue heron, and osprey, and their foraging and nesting habitat; permanent loss of general wildlife habitat; take and loss of foraging and nesting habitat for other birds of prey and migratory bird species; and loss of critical deer winter and fawning range (all action alternatives).

- **Cultural Resources** – Inundation of Traditional Cultural Properties (all action alternatives).

- **Land Use and Planning** – Conflict with existing land use goals and policies of affected jurisdictions (Shasta Lake and vicinity and upper Sacramento River), and disruption of existing land uses (Shasta Lake and vicinity and upper Sacramento River) (all action alternatives).

- **Aesthetics and Visual Resources** – Inconsistency with guidelines for visual resources in the USFS 1995 Shasta-Trinity National Forest Land and Resource Management Plan, degradation and/or obstruction of a scenic view from key observation points, and generation of increased daytime glare and/or nighttime lighting (all action alternatives).

- **Wild and Scenic River Considerations for McCloud River** – Effect on McCloud River's eligibility for listing as a Federal Wild and Scenic River and effects to McCloud River resources identified in the California Public Resources Code, Section 5093.542 (all action alternatives).

The action alternatives could also result in the following significant and unavoidable cumulative impacts (i.e., an impact would make a considerable contribution to a significant cumulative effect):

- **Geology, Geomorphology, Minerals, and Soils** – Cumulative effects from use of soil and mineral resources, leading to diminished regional availability of cement, concrete sand, and aggregate and loss of soil productivity (all action alternatives).

- **Air Quality and Climate** – Cumulative effects from emissions of nitrous oxide (NO_x) during project construction (all action alternatives).

- **Hydrology, Hydraulics, and Water Management** – Cumulative effects on south Delta water levels, X2 position, and Delta outflow (all action alternatives).

- **Botanical Resources and Wetlands** – Cumulative effects from inundation at Shasta Lake, leading to take and loss of habitat for special-status species at Shasta Lake and vicinity; cumulative effects from increased water delivery in the service areas and growth-related loss of sensitive plant communities and special-status plant species (all action alternatives).

- **Wildlife Resources** – Cumulative effects from inundation at Shasta Lake, leading to take and loss of habitat for numerous special-status species at Shasta Lake and vicinity (all action alternatives).

- **Cultural Resources** – Inundation of Traditional Cultural Properties (all action alternatives).

- **Power and Energy Resources** – Changes to net energy values due to energy use for CVP and SWP pumping, and loss of generation (CP1).

- **Aesthetics and Visual Resources** – Changes to aesthetic values and resources at Shasta Lake (all action alternatives).

- **Environmental Justice** – Cumulative effects from disproportionate placement of environmental impacts on Native American populations, leading to disturbance or loss of resources associated with locations considered by the Winnemem Wintu and Pit River Madesi Band members to have religious and cultural significance in the vicinity of Shasta Lake (all action alternatives).

S.9.4 Environmental Commitments

As part of project planning and environmental assessment, Reclamation has incorporated certain environmental commitments and best management practices into the action alternatives to avoid or minimize potential impacts. Reclamation will also coordinate planning, engineering, design and construction, operation, and maintenance phases of the any authorized project modifications with applicable resource agencies and potentially affected public and private landowners, communities, and individuals.

The following environmental commitments would be incorporated into any action alternative for any project-related construction activities:

- Develop and implement a construction management plan to avoid or minimize potential impacts to public health and safety during project construction (e.g., procedures for stockpiling and staging, public access routes, and construction notification).

- Comply with applicable laws, policies, and plans for this project, including all terms and conditions of all required project permits, approvals, and conditions attached thereto.

- Provide relocation assistance services for displaced individuals, families, businesses, and private property owners in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

- Remain consistent with USFS Built Environment Image Guide for any facilities subject to USFS authorization that are constructed or reconstructed facilities.

- Protect all Public Land Survey System monuments and associated references and all property corners, either by positioning, or, where necessary, creating new references.

- Evaluate and protect paleontological resources discovered during construction.

- Develop and implement a stormwater pollution prevention plan to prevent or minimize the discharge of sediments and other contaminants with the potential to affect beneficial uses or lead to violations of water quality objectives of surface waters.

  – Develop and implement an erosion and sediment control plan to control short-term and long-term erosion and sedimentation effects, and to stabilize soils and vegetation in areas affected by construction activities.

  – Develop and implement a feasible spill prevention and hazardous materials management plan to minimize effects from spills of hazardous, toxic, or petroleum substances for project-related activities occurring in or near waterways.

- Implement efforts to minimize potential adverse effects to water quality, including:

  – Implement in-water construction work windows to occur when instream flows are managed outside the flood season (e.g., June 15 to September 15).

  - Comply with all additional requirements specified in permits relating to water quality protection.

  - Implement best management practices (BMP) to avoid and/or minimize potential impacts to water quality associated with construction and the 10-year-long spawning gravel augmentation program. These BMPs include:

    - Handle spawning gravel to minimize potential water quality impact.

    - Minimize potential impacts associated with equipment contaminants.

    - Implement feasible spill prevention and hazardous materials management.

    - Minimize potential impacts associated with access and staging.

    - Remove temporary fills as appropriate.

    - Remove equipment from river overnight and during high flows.

- Extend and enhance existing fish habitat structures in Shasta Lake through the placement of manzanita brush structures and vegetation cleared for construction to maintain shallow water and transitional riverine habitat.

- Maintain shallow-water and transitional riverine habitat with placement of manzanita brush structures, large woody debris, and rock-boulder clusters for established USFS habitat program.

- Implement fisheries conservation efforts to minimize potential adverse effects on fish species, including:

  - Implement in-water construction work windows to occur when sensitive fish species are not present, or would be least susceptible to disturbance. In-river work between Keswick Dam and the RBPP would be conducted to minimize impacts to Sacramento River winter-run Chinook salmon, i.e., mid-August through September.

  - Monitor potential impacts to important fishery resources throughout all phases of project construction.

  - Perform fish rescue/salvage for fish entrapped within construction structures and cofferdam enclosures, and stop construction activities for spawning activities for sensitive fish species.

  - Prepare a letter report detailing the methodologies used and the findings of fish monitoring and rescue efforts.

- Survey and monitor fish migration between Shasta Lake and Squaw Creek to determine if warm-water fish (bass) actively migrate into and cause adverse effects on native fish, amphibians, and mollusks.

- Prepare a comprehensive revegetation plan to be implemented in conjunction with other management plans (e.g., erosion and sediment control plan).

- Develop and require implementation of a control plan to prevent the introduction of zebra/quagga mussels, invasive plants, and other invasive species to project areas.

- Prepare and implement a fire protection and prevention plan to minimize the risk of wildfire or threat to workers, property, and the public.

- Recycle or reuse demolished construction materials where practical. To reduce risk associated with exposure to hazardous materials and waste:

  - Implement a Hazardous Materials Business Plan (HMBP) to provide information regarding hazardous materials to be used for project implementation and hazardous waste that may be generated.

  - Dispose of soil at a landfill or recycling facilities, transported by a licensed waste hauler.

  - Review all relevant available asbestos survey and abatement reports and supplemental asbestos surveys. Removal and disposal of asbestos-containing materials would be performed in accordance with applicable Federal, State, and local regulations.

  - Conduct a lead-based paint survey to determine areas where lead-based paint is present and the possible need for abatement before construction.

- Demolish and remove all asphaltic roadways and parking lots inundated by the proposed Shasta Dam raise, per California Fish and Game Code 5650 Section (a).

The environmental commitment section of the DEIS included a commitment to develop and implement a mitigation plan to minimize potential impacts to physical, biological, and socioeconomic resources. In conjunction with an interagency, interdisciplinary team, Reclamation refined and enhanced the mitigation measures, including development of a framework to quantify impacts

(where appropriate) and establish mitigation ratios that were applicable to a number of impacts related to biological resources. The result of the development of the mitigation plan is documented in the Preliminary Environmental Commitments and Mitigation Plan (an appendix to this EIS).

S.10 Areas of Controversy

Federal, State, and local stakeholders identified several areas of controversy during SLWRI public outreach activities, including public scoping activities, agency meetings and workshops, and related ongoing stakeholder outreach activities. Key topics include potential adverse effects on cultural resources in the Shasta Lake area; recreation and recreation providers in the Whiskeytown-Shasta-Trinity NRA; the lower McCloud River and its special designation under California Public Resources Code Section 5093.542(c); impacts on reservoir area property owners; terrestrial special-status species around Shasta Lake, including State-designated fully protected species; fishery and riparian habitat resources along the upper Sacramento River; aquatic special-status species in the Sacramento River and Delta (including delta smelt); Delta water quality and south Delta water levels; Central Valley hydrology below CVP and SWP facilities and resulting effects on water supplies for water contractors and other water users; and assumptions on CVP and SWP regulatory constraints based on the 2008 USFWS BO and 2009 NMFS BO (discussed above).

S.11 Public Involvement and Next Steps

In accordance with NEPA review requirements, the DEIS was released for public and agency review and comment for a 90-day period. The comment period on the DEIS began on July 1, 2013, and closed on September 30, 2013. Written and verbal comments on the DEIS were accepted at three public workshops and three public hearings, and written comments were accepted throughout the comment period.

More than 5,000 comments were received on the DEIS from elected officials; federal, state, and tribal governments; regional and local governments and agencies; special interest groups, and individuals. The public comments have been reviewed and, in accordance with NEPA CEQ Regulations, responses have been developed for all substantive comments and revision of the DEIS have been made to clarify and enhance the text to produce this Final EIS.

Reclamation posted the Final EIS at http://www.usbr.gov/mp/slwri for public review and issued a notice in the Federal Register and a press release of the Final EIS. Also, elected officials and representatives, government agencies, private organizations, businesses, and individual members of the public on the mailing list have received a copy of this document or a notification of document availability.

The Final EIS and Final Feasibility Report will be used together to support the Federal decision. Typically, a ROD is the final step in the NEPA process and would document any decision on which actions, if any, to take to address the primary objectives.

The Final EIS, Final Feasibility Report, and supporting documents will be submitted by the Principal Deputy Commissioner of Reclamation to the Secretary of the Interior. After review by the Office of Management and Budget, in accordance with Executive Order 12322, the Secretary will transmit a Final EIS and Final Feasibility Report to the U.S. Congress to determine the type and extent of Federal interest in enlarging Shasta Dam and Reservoir if a plan is recommended for implementation. The proposed project would be considered for authorization by Congress and, if authorized, a separate appropriation authorization would be required. The project would be considered for inclusion in the President's budget based on (1) national priorities, (2) magnitude of the Federal commitment, (3) level of local support, (4) willingness of the non-Federal sponsor to fund its share of the project costs, and (5) budgetary constraints that may exist at the time of construction.

While this Final EIS has been prepared in consideration of CEQA requirements, to-date, formal CEQA scoping has not been initiated. This process may commence if and when a State lead agency is identified.

Table S-3. Summary of Impacts and Mitigation Measures

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Geology, Geomorphology, Minerals, and Soils						
Impact Geo-1: Exposure of Structures and People to Geologic Hazards Resulting from Seismic Conditions, Slope Instability, and Volcanic Eruptions	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	Pool level increase would inundate 78 acres (CP1), 110 acres (CP2), or 173 acres (CP3, CP4,CP4A and CP5) of mapped slope instability hazard	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-2: Alteration of Fluvial Geomorphology and Hydrology of Aquatic Habitats	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	S	Mitigation Measure Geo-2: Replace Lost Ecological Functions of Aquatic Habitats by Restoring Existing Degraded Aquatic Habitats in the Vicinity of the Impact.	LTS
Impact Geo-3: Loss or Diminished Availability of Known Mineral Resources That Would Be of Future Value to the Region	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	S	No feasible mitigation is available to reduce impact.	SU

Notes:

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Geo-4: Lost or Diminished Soil Biomass Productivity	N-A	NA	–	NI	NA	NI
	CP1	Long-term	Loss of 1,954.6 acres of moderate productivity land; 1604.5 acres of low productivity land; 565 acres of nonproductive land	S	No feasible mitigation is available to reduce impact.	SU
	CP2	Long-term	Loss of 2,128 acres of moderate productivity land; 1,751 acres of low productivity land; 638 acres of nonproductive land	S	No feasible mitigation is available to reduce impact.	SU
	CP3–CP5	Long-term	Loss of 2,301 acres of moderate productivity land; 2,092 acres of low productivity land; 760 acres of nonproductive land	S	No feasible mitigation is available to reduce impact.	SU
Impact Geo-5: Substantial Soil Erosion or Loss of Topsoil Due to Shoreline Processes	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Soil erosion of approximately 421,000 cubic yards per year for the first 15 years	S	No feasible mitigation is available to reduce impact.	SU
	CP2	Short-term and long-term	Soil erosion of approximately 549,000 cubic yards per year for the first 15 years	S	No feasible mitigation is available to reduce impact.	SU
	CP3-CP5	Short-term and long-term	Soil erosion of approximately 767,000 cubic yards per year for the first 15 years	S	No feasible mitigation is available to reduce impact.	SU
Impact Geo-6: Substantial Soil Erosion or Loss of Topsoil Due to Upland Processes	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	Up to approximately 3,340 acres in the upland portion of the Shasta Lake and vicinity area could be disturbed	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Geo-7: Be Located on a Geologic Unit or Soil that Is Unstable, or that Would Become Unstable as a Result of the Project, and Potentially Result in Subsidence	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-8: Failure of Septic Tanks or Alternative Wastewater Disposal Systems Due to Soils that are Unsuited to Land Application of Waste	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-9: Substantial Increase in Channel Erosion and Meander Migration	N-A	Long-term	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	Mitigation Measure Geo-9: Modification of Flow Releases in Response to River Management and Habitat Restoration Efforts between Keswick Dam and Red Bluff.	LTS
Impact Geo-10: Substantial Soil Erosion or Loss of Topsoil Due to Construction	N-A	NA	–	NI	NA	NI
	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-11: Alteration of Fluvial Geomorphology	N-A	NA	–	NI	NA	NI
	CP1–CP3	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Geo-12: Alteration of Downstream Tributary Fluvial Geomorphology Due to Shasta Dam Operations	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-13: Substantial Increase in Channel Erosion and Meander Migration (Lower Sacramento River and Delta)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Geo-14: Substantial Increase in Channel Erosion and Meander Migration (CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Air Quality and Climate						
Impact AQ-1: Short-Term Emissions of Criteria Air Pollutants and Precursors at Shasta Lake and Vicinity During Project Construction	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	NO_X emissions >137 lb/day, possible ROG & PM_{10} emissions >137 lb/day	S	Mitigation Measure AQ-1: Implement Standard Measures and Best Available Mitigation Measures to Reduce Emissions Levels.	SU

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Impact AQ-2: Long-Term Emissions of Criteria Air Pollutants and Precursors During Project Operation	N-A,	Long-term	–	LTS	NA	LTS
	CP1,	Long-term	Increase of an average of 158 one-way daily trips	LTS	No mitigation needed, thus none proposed.	LTS
	CP2	Long-term	Increase of an average of 238 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Increase of an average of 364 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4	Long-term	Increase of an average of 658 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4A	Long-term	Increase of an average of 460 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Increase of an average of 311 one-way daily trips	LTS	No mitigation needed; thus, none proposed.	LTS
Impact AQ-3: Exposure of Sensitive Receptors to Substantial Pollutant Concentrations	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term and long-term	Exposure to CO, PM_{10}, PM_{25}, diesel PM	LTS	No mitigation needed; thus, none proposed.	LTS
Impact AQ-4: Exposure of Sensitive Receptors to Odor Emissions	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact AQ-5: Short-Term Emissions of Criteria Air Pollutants and Precursors Below Shasta Dam During Project Construction	N-A,	NA	–	NI	NA	NI
	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Short-term	Would add an additional 1 lb/day of ROG, 16 lb/day of NO_X, & 1 lb/day of PM_{10} to construction	LTS	No mitigation needed; thus, none proposed.	LTS
Impact AQ-6: Generation of Greenhouse Gases	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Short-term	Emission of 15,100 to 83,400 metric tons CO_2e	LTS	No mitigation needed; thus, none proposed.	LTS
Hydrology, Hydraulics, and Water Management						
Impact H&H-1: Change in Frequency of Flows Above 100,000 cfs on the Sacramento River Below Bend Bridge	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	B	No mitigation needed; thus, none proposed.	B
Impact H&H-2: Place Housing or Other Structures Within a 100-Year Flood Hazard Area as Mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or Other Flood Hazard Delineation Map	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact H&H-3: Place Within a 100-Year Flood Hazard Area Structures That Would Impede or Redirect Flood Flows	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact H&H-4: Change in Water Levels in the Old River near Tracy Road Bridge	N-A	Long-term	Lower water levels	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
H&H-5: Change in Water Levels in the Grant Line Canal near the Grant Line Canal Barrier	N-A	Long-term	Lower water levels	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-6: Change in Water Levels in the Middle River near the Howard Road Bridge	N-A	Long-term	Lower water levels	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-7: Change in X2 Position	N-A	NA	–	NI	NA	NI
	CP1 & CP4	NA	–	NI	No mitigation needed; thus, none proposed.	NI
	CP2, CP3, CP4A, & CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-8: Change in Recurrence of Delta Excess Conditions	N-A	Long-term	Reduced frequency	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact H&H-9: Change in Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	N-A	Long-term	Reduced frequency	PS	NA	PS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-10: Change in Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	N-A	Long-term	Reduced frequency	PS	NA	PS
	CP1, CP3–CP5	Long-term	–	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-11: Change in Deliveries to SWP Table A, Contractors	N-A	Long-term	Reduced frequency	B	NA	B
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact H&H-12: Change in Groundwater	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Short-term and long-term	Increased groundwater levels	B	No mitigation needed; thus, none proposed.	B
Impact H&H-13: Change in Groundwater Quality	N-A	Short-term and long-term	–	LTS	NA	LTS
	CP1–CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Water Quality						
Impact WQ-1: Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Short-term changes in the amount of exposed area that would be subject to erosion	PS	Mitigation Measure WQ-1: Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS
	CP2	Short-term	Similar to CP1, but greater area and longer duration	PS	Mitigation Measure WQ-1: Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS
	CP3–CP5	Short-term	Similar to CP1 and CP2, but greater area and longer duration	PS	Mitigation Measure WQ-1: Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS

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Impact WQ-2: Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Some areas potentially subject to surface disturbance, including jurisdictional waters	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	Similar to CP1, but greater area and longer duration	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Short-term	Similar to CP1 and CP2, but greater area and longer duration	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-3: Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-4: Long-Term Sediment Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	PS	Mitigation Measure WQ-4: Implement Mitigation Measure WQ-1 (CP1): Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS

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Impact WQ-5: Long-Term Temperature Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	N-A	NA	–	NI	NA	NI
	CP1	Long-term	5 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	10 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	14 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4	Long-term	17 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4A	Long-term	16 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	13 percent increase in the end-of-month storage on an annual basis compared to No-Action Alternative	LTS	No mitigation needed; thus, none proposed.	LTS
WQ-6: Long-Term Metals Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	PS	Mitigation Measure WQ-6: Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WQ-7: Temporary Construction-Related Sediment Effects on the Upper Sacramento River that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP3	Temporary	–	PS	Mitigation Measure WQ-7 (CP1–CP3): Implement Mitigation Measure WQ-1 (CP1): Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS
	CP4 & CP4A	Temporary	Similar to CP1–CP3, but greater	PS	Mitigation Measure WQ-7 (CP4): Implement Mitigation Measure WQ-1 (CP1): Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS
	CP5	Temporary	Similar to CP4, but greater	PS	Mitigation Measure WQ-7 (CP5): Implement Mitigation Measure WQ-1 (CP1): Develop and Implement a Comprehensive Multi-scale Sediment Reduction and Water Quality Improvement Program Within Watersheds Tributary to the Primary Study Area.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WQ-8: Temporary Construction-Related Temperature Effects on the Upper Sacramento River that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP5	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-9: Temporary Construction-Related Metal Effects on the Upper Sacramento River that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP5	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-10: Long-Term Sediment Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WQ-11: Long-Term Temperature Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	N-A	NA	–	LTS	NA	LTS
	CP1	Long-term	Reduce temperature exceedences at Bend Bridge by 4 percent under existing conditions and 5 percent under future conditions	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Reduce temperature exceedences at Bend Bridge by 7 percent under existing conditions and future conditions	B	No mitigation needed; thus, none proposed.	B
	CP3	Long-term	Reduce temperature exceedences at Bend Bridge by 11 percent under existing conditions and 10 percent under future conditions	B	No mitigation needed; thus, none proposed.	B
	CP4	Long-term	Reduce temperature exceedences at Bend Bridge by 13 percent under existing conditions and future conditions	B	No mitigation needed; thus, none proposed.	B
	CP4A	Long-term	Reduce temperature exceedences at Bend Bridge by 11 percent under existing conditions and future conditions	B	No mitigation needed; thus, none proposed.	B
	CP5	Long-term	Reduce temperature exceedences at Bend Bridge by 10 percent under existing conditions and future conditions	B	No mitigation needed; thus, none proposed.	B
Impact WQ-12: Long-Term Metals Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	PS	Mitigation Measure WQ-12: Implement Mitigation Measure WQ-6 (CP1): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WQ-13: Temporary Construction-Related Sediment Effects on the Extended Study Area that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP5	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-14: Temporary Construction-Related Temperature Effects on the Extended Study Area that Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP5	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-15: Temporary Construction-Related Metal Effects on the Extended Study Area that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	N-A	NA	–	NI	NA	NI
	CP1–CP5	Temporary	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-16: Long-Term Sediment Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

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Impact WQ-17: Long-Term Temperature Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-18: Long-Term Metals Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	PS	Mitigation Measure WQ-18: Implement Mitigation Measure WQ-6 (CP1): Prepare and Implement a Site-Specific Remediation Plan for Historic Mine Features Subject to Inundation in the Vicinity of the Bully Hill and Rising Star Mines	LTS
Impact WQ-19a: Delta Salinity on the Sacramento River at Collinsville	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19b: Delta Salinity on the San Joaquin River at Jersey Point	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19c: Delta Salinity on the Sacramento River at Emmaton	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WQ-19d: Delta Salinity on the Old River at Rock Slough	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19e: Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19f: Delta Water Quality on the West Canal at the Mouth of the Clifton Court Forebay	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19g: Delta Salinity on the San Joaquin River at Vernalis	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19h: Delta Salinity on the San Joaquin River at Brandt Bridge	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19i: Delta Salinity on the Old River near the Middle River	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS
Impact WQ-19j: Delta Salinity on the Old River at Tracy Road Bridge	N-A	NA	–	LTS	NA	LTS
	CP1–CP5	Long-term	No additional violations of water quality standards	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WQ-20: X2 Position	N-A	NA	–	PS	NA	SU
	CP1–CP5	Long-term	No increase in number of months in which X2 is out of compliance in extended study area (Delta)	LTS	No mitigation needed; thus, none proposed.	LTS
Noise and Vibration						
Impact Noise-1: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Construction Noise	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP3	Short-term	On-site heavy duty construction equipment at other project sites – exterior noise levels at noise-sensitive receptors located within 75 – 7,000 feet of construction activity could exceed applicable standards	S	Mitigation Measure Noise-1: Implement Measures to Prevent Exposure of Sensitive Receptors to Temporary Construction Noise at Project Construction Sites.	LTS
	CP4–CP5	Short-term	Similar to CP1–CP3, but greater noise related to gravel augmentation and habitat restoration along the upper Sacramento River	S	Mitigation Measure Noise-1: Implement Measures to Prevent Exposure of Sensitive Receptors to Temporary Construction Noise at Project Construction Sites.	LTS
Impact Noise-2: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Vibration During Construction	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Noise-3: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Mobile Source Noise During Operations	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Hazards and Hazardous Materials and Waste						
Impact Haz-1: Wildland Fire Risk (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Increased risk of ignition during construction	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer construction duration	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS
	CP3	Short-term	Similar to CP1 & CP2, but greater and longer construction duration	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS
	CP4–CP5	Short-term	Similar to CP3, but greater and longer construction duration	PS	Mitigation Measure Haz-1: Coordinate and Assist Public Services Agencies to Reduce Fire Hazards.	LTS
Impact Haz-2: Release of Potentially Hazardous Materials or Hazardous Waste (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Risk of release of hazardous materials during construction	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer construction duration	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS
	CP3	Short-term	Similar to CP1 & CP2, but greater and longer construction duration	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS
	CP4–CP5	Short-term	Similar to CP3, but greater construction	PS	Mitigation Measure Haz-2: Reduce Potential for Release of Hazardous Materials and Waste.	LTS

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Impact Haz-3: Exposure of Workers to Hazardous Materials (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Risk of exposure to hazardous materials during construction	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer duration	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Short-term	Similar to CP1 & CP2, but greater and longer duration construction	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4–CP5	Short-term	Similar to CP3, but greater construction	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Haz-4: Exposure of Sensitive Receptors to Hazardous Materials (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Risk of exposure to hazardous materials during construction	PS	Mitigation Measure Haz-4: Reduce Potential for Exposure of Sensitive Receptors to Hazardous Materials or Waste.	LTS
	CP2	Short-term	Similar to CP1, but greater and longer construction duration	PS	Mitigation Measure Haz-4: Reduce Potential for Exposure of Sensitive Receptors to Hazardous Materials or Waste.	LTS
	CP3	Short-term	Similar to CP1 & CP2, but greater and longer construction duration	PS	Mitigation Measure Haz-4: Reduce Potential for Exposure of Sensitive Receptors to Hazardous Materials or Waste.	LTS
	CP4–CP5	Short-term	Similar to CP3, but greater construction	PS	Mitigation Measure Haz-4: Reduce Potential for Exposure of Sensitive Receptors to Hazardous Materials or Waste.	LTS

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Impact Haz-5: Wildland Fire Risk (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Haz-6: Release of Potentially Hazardous Materials or Hazardous Waste (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Haz-7: Exposure of Workers to Hazardous Materials (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Haz-8: Exposure of Sensitive Receptors to Hazardous Materials (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Agriculture and Important Farmlands						
Impact Ag-1: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Vicinity of Shasta Lake	N-A	Permanent	–	PS	NA	SU
	CP1–CP5	Permanent	–	NI	No mitigation needed; thus, none proposed.	NI

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Impact Ag-2: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Vicinity of Shasta Lake	N-A	NA	NA	NI	NA	NI
	CP1	Permanent	Permanent conversion of forest land by inundation and infrastructure relocation	S	No feasible mitigation is available to reduce impact.	SU
	CP2	Permanent	Similar to CP1, but greater.	S	No feasible mitigation is available to reduce impact.	SU
	CP3–CP5	Permanent	Similar to CP1 and CP2, but greater.	S	No feasible mitigation is available to reduce impact.	SU
Impact Ag-3: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the Upper Sacramento River	N-A	Permanent	–	PS	NA	SU
	CP1 & CP4	Permanent	Inundation of lands or soil saturation due to increased flows.	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Permanent	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Permanent	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Permanent	Similar to CP1, CP2, & CP3 but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Ag-4: Direct and Indirect Conversion of Forest Land to Nonforest Uses Along the Upper Sacramento River	N-A	Permanent	–	LTS	NA	LTS
	CP1	Permanent	Altered dynamics and structure of forests in the riparian corridor along the upper Sacramento River due to increased flows	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Permanent	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Ag-5: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Extended Study Area	N-A	Permanent	–	PS	NA	SU
	CP1–CP5	Permanent	Inundation of lands or soil saturation due to increased flows.	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Ag-6: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Extended Study Area	N-A	Permanent	–	LTS	NA	LTS
	CP1–CP5	Permanent	Altered dynamics and structure of forests in the riparian corridor in the extended study area due to increased flows	LTS	No mitigation needed; thus, none proposed.	LTS
Fisheries and Aquatic Ecosystems						
Impact Aqua-1: Effects on Nearshore, Warm-Water Habitat in Shasta Lake from Project Operations	N-A	Permanent	–	LTS	NA	LTS
	CP1–CP5	Permanent	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-2: Effects on Nearshore, Warm-Water Habitat in Shasta Lake from Project Construction	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-3: Effects on Cold-Water Habitat in Shasta Lake	N-A	Long-term	–	PS	NA	PS
	CP1–CP5	Long-term	–	B	No mitigation needed; thus, none proposed.	B

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Impact Aqua-4: Effects on Special-Status Aquatic Mollusks	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Permanent	–	PS	Mitigation Measure Aqua-4: Implement Mitigation Measure Geo-2: Replace Lost Ecological Functions of Aquatic Habitats by Restoring Existing Degraded Aquatic Habitats in the Vicinity of the Impact.	LTS
Impact Aqua-5: Effects on Special-Status Fish Species	N-A	–	–	LTS	NA	LTS
	CP1–CP5	–	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-6: Creation or Removal of Barriers to Fish Between Tributaries and Shasta Lake	N-A	NA	–	NI	NA	NI
	CP1–CP5	Permanent	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Aqua-7: Effects on Spawning and Rearing Habitat of Adfluvial Salmonids in Low-Gradient Tributaries to Shasta Lake	N-A	NA	–	NI	NA	NI
	CP1	Permanent	5.4 miles of low-gradient reaches	PS	Mitigation Measure Aqua-7: Implement Mitigation Measure Aqua-4: Replace Lost Ecological Functions of Aquatic Habitats by Restoring Existing Degraded Aquatic Habitats in the Vicinity of the Impact.	LTS
	CP2	Permanent	7.4 miles of low-gradient reaches	PS	Mitigation Measure Aqua-7: Implement Mitigation Measure Aqua-4: Replace Lost Ecological Functions of Aquatic Habitats by Restoring Existing Degraded Aquatic Habitats in the Vicinity of the Impact.	LTS
	CP3–CP5	Permanent	11 miles of low-gradient reaches	PS	Mitigation Measure Aqua-7: Implement Mitigation Measure Aqua-4: Replace Lost Ecological Functions of Aquatic Habitats by Restoring Existing Degraded Aquatic Habitats in the Vicinity of the Impact.	LTS
Impact Aqua-8: Effects on Aquatic Connectivity in Non-Fish-Bearing Tributaries to Shasta Lake	N-A	NA	–	NI	NA	NI
	CP1	Permanent	12.6 miles of non-fish-bearing tributary habitat	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	17.3 miles of non-fish-bearing tributary habitat	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Permanent	24.0 miles of non-fish-bearing tributary habitat	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Aqua-9: Effects on Water Quality at Livingston Stone Hatchery	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Aqua-10: Loss or Degradation of Aquatic Habitat in the Upper Sacramento River During Construction Activities	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-11: Release and Exposure of Contaminants in the Upper Sacramento River During Construction Activities	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term and long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-12: Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operation—Chinook Salmon and Steelhead	N-A	NA	–	PS	NA	PS
	CP1	Long-term	Improved flow and water temperature conditions in the upper Sacramento River	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater benefits	B	No mitigation needed; thus, none proposed.	B
	CP3 & CP5	Long-term	Similar to CP1 and CP2, but greater benefits	B	No mitigation needed; thus, none proposed.	B
	CP4 & CP4A	Long-term	Similar to CP1- CP3 & CP5, but greater benefits	B	No mitigation needed; thus, none proposed.	B

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Impact Aqua-13: Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operation—Steelhead, Green Sturgeon, Sacramento Splittail, American Shad, and Striped Bass	N-A	NA	–	PS	NA	PS
	CP1	Long-term	Slightly improved flow and water temperature conditions in the upper Sacramento River	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Long-term	Similar to CP1 & CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4 & CP4A	Long-term	Similar to CP1–CP3 & CP5, but greater in magnitude	B	No mitigation needed; thus, none proposed.	B
Impact Aqua-14: Reduction in Ecologically Important Geomorphic Processes in the Upper Sacramento River Resulting from Reduced Frequency and Magnitude of Intermediate to High Flows	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	PS	Mitigation Measure Aqua-14: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Impact Aqua-15: Changes in Flow and Water Temperatures in the Lower Sacramento River and Tributaries and Trinity River Resulting from Project Operation – Fish Species of Primary Management Concern	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	PS	Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS
Impact Aqua-16: Reduction in Ecologically Important Geomorphic Processes in the Lower Sacramento River Resulting from Reduced Frequency and Magnitude of Intermediate to High Flows	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	PS	Mitigation Measure Aqua-16: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Aqua-17: Effects to Delta Fishery Habitat Resulting from Changes to Delta Outflow	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-18: Effects to Delta Fisheries Resulting from Changes to Delta Inflow	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Aqua-19: Effects to Delta Fisheries Resulting from Changes in Sacramento River Inflow	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-20: Effects to Delta Fisheries Resulting from Changes in San Joaquin River Flow at Vernalis	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Aqua-21: Reduction in Low-Salinity Habitat Conditions Resulting from an Upstream Shift in X2 Location	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-22: Increase in Mortality of Species of Primary Management Concern as a Result of Increased Reverse Flows in Old and Middle Rivers	N-A	NA	NA	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Aqua-23: Increase in the Risk of Entrainment or Salvage of Species of Primary Management Concern at CVP and SWP Export Facilities Due to Changes in CVP and SWP Exports	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	PS	None proposed because operations will be guided by RPAs established by NMFS and USFWS BOs to reduce any impacts to listed fish species, and thus reduce impacts to non-listed fish species	LTS

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Impact Aqua-24: Impacts on Aquatic Habitats and Fish Populations in the CVP and SWP Service Areas Resulting from Modifications to Existing Flow Regimes	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Botanical Resources and Wetlands						
Impact Bot-1: Loss of Federally or State Listed Plant Species	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Bot-2: Loss of MSCS Covered Species	N-A	Permanent	–	NI	NA	NI
	CP1	Permanent	Portions of MSCS plant populations could be inundated	S	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.	SU
	CP2	Permanent	Greater than CP1	S	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.	SU
	CP3–CP5	Permanent	Greater than CP1 & CP2	S	Mitigation Measure Bot-2: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate MSCS Plants; and Revegetate Affected Areas.	SU

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Impact Bot-3: Loss of USFS Sensitive, BLM Sensitive, or CRPR Species	N-A	Permanent	–	NI	NA	NI
	CP1	Permanent	Portions of USFS sensitive, BLM sensitive, and CRPR species plant populations could be inundated	PS	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.	SU
	CP2	Permanent	Greater than CP1	PS	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.	SU
	CP3–CP5	Permanent	Greater than CP1 & CP2	PS	Mitigation Measure Bot-3: Acquire and Preserve Mitigation Lands; Avoid Populations; Relocate USFS Sensitive, BLM Sensitive, and CRPR Plants and Revegetate Affected Areas.	SU
Impact Bot-4: Loss of Jurisdictional Waters	N-A	Permanent	–	NI	NA	NI
	CP1	Permanent	Loss of jurisdictional waters caused by flooding the impoundment area and discharge of fill associated with the relocation of facilities and dam construction	S	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.	SU
	CP2	Permanent	Greater than CP1	S	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.	SU
	CP3–CP5	Permanent	Greater than CP1 & CP2	S	Mitigation Measure Bot-4: Mitigate Loss of Jurisdictional Waters.	SU

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Impact Bot-5: Loss of General Vegetation Habitats	N-A	Permanent	–	NI	NA	NI
	CP1	Permanent	Loss of general vegetation habitats because of inundation, vegetation removal, or construction activities	PS	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.	SU
	CP2	Permanent	Greater than CP1	PS	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.	SU
	CP3–CP5	Permanent	Greater than CP1 & CP2	PS	Mitigation Measure Bot-5: Acquire and Preserve Mitigation Lands for Loss of General Vegetation Habitats.	SU
Impact Bot-6: Spread of Noxious and Invasive Weeds	N-A	NA	–	NI	NA	NI
	CP1	Long-term and/or permanent	Spread of noxious and invasive weeds as a result of ground-disturbing activities during construction and an increased number of vectors	PS	Mitigation Measure Bot-6: Develop and Implement a Weed Management Plan In Conjunction with Stakeholders.	LTS
	CP2	Long-term and/or permanent	Greater than CP1	PS	Mitigation Measure Bot-6: Develop and Implement a Weed Management Plan In Conjunction with Stakeholders.	LTS
	CP3–CP5	Long-term and/or permanent	Greater than CP1 & CP2	PS	Mitigation Measure Bot-6: Develop and Implement a Weed Management Plan In Conjunction with Stakeholders.	LTS

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Impact Bot-7: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes	N-A	Long-term	–	LTS	NA	LTS
	CP1 & CP4	Long-term	Altered flow regimes on the upper Sacramento River could alter the structure and species composition or cause the loss of special-status species and habitat	S	Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP2 & CP4A	Long-term	Greater than CP1	S	Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP3 &	Long-term	Greater than CP1 &CP2	S	Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP5	Long-term	Greater than CP1, CP2, & CP3	S	Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Impact Bot-8: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Long-term	Adverse effects on riparian communities along the upper Sacramento River in conflict with local or regional plans	PS	Mitigation Measure Bot-8: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Bot-9: Disturbance or Removal of Designated Critical Habitat for Special-Status Species	N-A	Long-term and/or permanent	–	LTS	NA	LTS
	CP1 & CP4	Long-term and/or permanent	Small reduction in the frequency and magnitude of overbank flows could affect vernal pool habitats, if present	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term and/or permanent	Greater than CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term and/or permanent	Greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term and/or permanent	Greater than CP1, CP2, & CP3	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Bot-10: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth	N-A	Permanent	–	LTS	NA	LTS
	CP1 & CP4	Permanent	Increased water supplies for deliveries to water districts in the primary study area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Permanent	Greater than CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Permanent	Greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 & CP5	Permanent	Greater than CP1, CP2, & CP3	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Bot-11: Loss of Sensitive Natural Communities or Habitats Resulting from Implementing the Gravel Augmentation Program or Restoring Riparian, Floodplain, and Side Channel Habitats	N-A	NA	–	NI	NA	NI
	CP1–CP3	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	Potential removal of riparian and wetland vegetation or the degradation of riparian and wetland habitats	PS	Mitigation Measure Bot-11: Revegetate Disturbed Areas, Consult with CDFW, and Mitigate Loss of Jurisdictional Waters.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Bot-12: Loss of Special-Status Plants Resulting from Implementing the Gravel Augmentation Program, or Restoring Riparian, Floodplain, and Side Channel Habitats	N-A	NA	–	NI	NA	NI
	CP1–CP3	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	Vegetation removal and gravel placement could result in the loss of special-status plants if present	PS	Mitigation Measure Bot-12: Conduct Preconstruction Surveys for Special-Status Plants and Avoid Special-Status Plant Populations During Construction.	LTS
Impact Bot-13: Spread of Noxious and Invasive Weeds Resulting from Implementing the Gravel Augmentation Program, Restoring Riparian, Floodplain, and Side Channel Habitats	N-A	NA	–	NI	NA	NI
	CP1–CP3	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	Potential spread of noxious and invasive weeds as a result of vegetation clearing and grubbing and an increased number of vectors	PS	Mitigation Measure Bot-13: Implement Weed Management Measures and Revegetation.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Bot-14: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes on the Lower Sacramento River	N-A	Long-term	–	LTS	NA	LTS
	CP1 & CP4	Long-term	Altered flow regimes on the lower Sacramento River could alter the structure and species composition or cause the loss of special-status species and habitat	S	Mitigation Measure Bot-14: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP2 & CP4A	Long-term	Greater than CP1	S	Mitigation Measure Bot-14: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP3		Greater than CP1 & CP2		Mitigation Measure Bot-14: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP5	Long-term	Greater than CP1, CP2, & CP5	S	Mitigation Measure Bot-14: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Impact Bot-15: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management Along the Lower Sacramento River	N-A	Long-term	–	PS	NA	SU
	CP1–CP5	Long-term	Adverse effects on riparian communities along the lower Sacramento River in conflict with local or regional plans	PS	Mitigation Measure Bot-15: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Bot-16: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth Along the Lower Sacramento River and in the Delta	N-A	Long-term	–	LTS	NA	LTS
	CP1 & CP4	Long-term	Increased water supplies for deliveries to water districts in the extended study area along the lower Sacramento River	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Greater than CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Greater than CP1 & Cp2	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Greater than CP1, CP2 & CP3	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Bot-17: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes in the CVP/SWP Service Areas	N-A	Long-term	–	LTS	NA	LTS
	CP1 & CP4	Long-term	Altered flow regimes in the CVP/SWP service areas could alter the structure and species composition or cause the loss of special-status species and habitat	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Greater than CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3		Greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Greater than CP1, CP2, & CP3	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Bot-18: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management in the CVP/SWP Service Areas	N-A	Long-term	–	LTS	NA	LTS
	CP1–, CP5	Long-term	Adverse effects on riparian communities in the CVP/SWP service areas in conflict with local or regional plans	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Bot-19: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas	N-A	Long-term	–	LTS	NA	LTS
	CP1 & CP4	Long-term	Increased water supplies for deliveries to water districts in the CVP/SWP service areas	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Greater than CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3		Greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Greater than CP1, CP2, & CP3	LTS	No mitigation needed; thus, none proposed.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Wildlife Resources						
Impact Wild-1: Take and Loss of Habitat for the Shasta Salamander	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Loss of approximately 42 acres of limestone habitat and 4,056 acres of non-limestone habitat	S	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.	SU
	CP2	Short-term and long-term	Loss of approximately 45 acres of limestone habitat and 4,536 acres of non-limestone habitat	S	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.	SU
	CP3–CP5	Short-term and permanent	Loss of approximately 51 acres of limestone habitat and 5,266 acres of non-limestone habitat	S	Mitigation Measure Wild-1: Avoid, Relocate, and Acquire Mitigation Lands for Shasta Salamander.	SU
Impact Wild-2: Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Loss of approximately habitat	PS	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.	SU
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.	SU
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-2: Avoid, Relocate, and Acquire Mitigation Lands for Foothill Yellow-Legged Frog and Tailed Frog.	SU

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

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Impact Wild-3: Impact on the Northwestern Pond Turtle and Its Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Loss of habitat	PS	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.	SU
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.	SU
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-3: Avoid, Relocate, and Acquire Mitigation Lands for Northwestern Pond Turtle.	SU
Impact Wild-4: Impact on the American Peregrine Falcon	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	Loss of nests	PS	Mitigation Measure Wild-4: Conduct Preconstruction Surveys for the American Peregrine Falcon and Establish Buffers.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Wild-5: Take and Loss of Habitat for the Bald Eagle	N-A	NA	–	NI	NA	NI
	CP1	Long-term	Inundation of nest trees, increase of prey habitat in primary study area	S	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.	SU
	CP2	Long-term	Similar to CP1, but greater	S	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.	SU
	CP3–CP5	Long-term	Similar to CP1 & CP2, but greater	S	Mitigation Measure Wild-5: Acquire and Preserve Mitigation Lands; Conduct Protocol-Level Surveys for the Bald Eagle and Establish Buffers.	SU
Impact Wild-6: Loss of Dispersal Habitat for the Northern Spotted Owl	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Loss of nests and habitat	PS	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands, Habitat Enhancement.	LTS
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands, Habitat Enhancement.	LTS
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-6: Acquire and Preserve Mitigation Lands, Habitat Enhancement.	LTS

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Impact Wild-7: Impact on the Purple Martin and Its Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Loss of potential nest sites in primary study area	S	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for Purple Martin and Establish Buffers.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater loss of nest sites	S	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for Purple Martin and Establish Buffers.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 &CP2, but greater loss of nest sites	S	Mitigation Measure Wild-7: Conduct a Preconstruction Survey for Purple Martin and Establish Buffers.	SU
Impact Wild-8: Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Loss of nests and habitat	PS	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.	SU
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.	SU

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Impact Wild-8: Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat (contd.)	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-8: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Establish Buffers.	SU
Impact Wild-9: Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Loss of nests and habitat	PS	Mitigation Measure Wild-9: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers.	SU
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-9: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers.	SU
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-9: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Establish Buffers.	SU

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Impact Wild-10: Take and Loss of Habitat for the Pacific Fisher	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Construction-related mortality and loss of habitat	PS	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.	SU
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.	SU
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-10: Acquire and Preserve Mitigation Lands; Conduct Preconstruction Surveys for the Pacific Fisher and Establish Buffers.	SU

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Impact Wild-11: Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, and Yuma Myotis), the American Marten, and Ringtails and Their Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Construction-related mortality and loss of habitat in primary study area	PS	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-11: Acquire and Preserve Mitigation Lands; Conduct a Preconstruction Survey for Special-Status Bats, American Marten, and Ringtails and Establish Buffers.	SU

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Wild-12: Impacts on Special-Status Terrestrial Mollusks (Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and permanent	Ground-disturbing activities, inundation of habitat	S	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.	SU
	CP2	Short-term and permanent	Similar to CP1, but greater (larger area of inundation)	S	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.	SU
	CP3–CP5	Short-term and permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	S	Mitigation Measure Wild-12: Avoid Suitable Habitat; Acquire and Preserve Mitigation Lands for Special-Status Terrestrial Mollusks.	SU
Impact Wild-13: Permanent Loss of General Wildlife Habitat	N-A	NA	–	NI	NA	NI
	CP1	Permanent	Inundation of habitat	PS	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.	SU
	CP2	Permanent	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.	SU
	CP3–CP5	Permanent	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-13: Acquire and Preserve Mitigation Lands for Permanent Loss of General Wildlife Habitat.	SU

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Wild-14: Impacts on Other Birds of Prey (Red-Tailed Hawk and Red-Shouldered Hawk) and Migratory Bird Species (American Robin, Anna's Hummingbird) and Their Foraging and Nesting Habitat	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Loss of nests and habitat	PS	Mitigation Measure Wild-14: Acquire and Preserve Mitigation Lands and Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-14: Acquire and Preserve Mitigation Lands and Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-14: Acquire and Preserve Mitigation Lands and Conduct Preconstruction Surveys for Other Nesting Raptors and Migratory Birds and Establish Buffers.	SU

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Impact Wild-15: Loss of Critical Deer Winter and Fawning Range	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Loss of wintering and fawning range	PS	Mitigation Measure Wild-15: Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater (larger area of inundation)	PS	Mitigation Measure Wild-15: Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (larger area of inundation)	PS	Mitigation Measure Wild-15: Acquire and Preserve Mitigation Lands for Permanent Loss of Critical Deer Wintering and Fawning Range.	SU
Impact Wild-16: Take and Loss of California Red-Legged Frog	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	[TBD]	[TBD]	[TBD]	[TBD]

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Wild-17: Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area	N-A	Long-term	–	LTS	NA	LTS
	CP1 & CP4	Long-term	Adverse effects on habitat for a variety of riparian-dependent special-status species	PS	Mitigation Measure Wild-17: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP2 & CP4A	Long-term	CP2 similar to CP1 but greater in magnitude	PS	Mitigation Measure Wild-17: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP3–CP5	Long-term	CP3 & CP5 similar to CP1, CP2, and CP4, but greater in magnitude;	PS	Mitigation Measure Wild-17: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Impact Wild-18: Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes	N-A	Long-term	Reduction in rate of bank erosion	LTS	NA	LTS
	CP1 & CP4,	Long-term		LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	CP2 similar to CP1, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3 &CP5	Long-term	CP3 & CP5 similar to CP1 & CP2, but greater in magnitude	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Wild-19: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime	N-A	NA	–	NI	NA	NI
	CP1-CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Wild-20: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area	N-A	NA	–	NI	NA	NI
	CP1 & CP4,	Long-term	Goals of local and regional plans could be more difficult to attain	PS	Mitigation Measure Wild-20: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
	CP2 & CP4A	Long-term	CP2 & CP4A similar to CP1, but greater in magnitude	PS	Mitigation Measure Wild-20: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Impact Wild-20: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area (contd.)	CP3 &CP5	Long-term	CP3 & CP5 similar to CP1–CP2, but greater in magnitude	PS	Mitigation Measure Wild-20: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS
Impact Wild-21: Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program	N-A	NA	–	NI	NA	NI
	CP1–CP3	NA	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	–	PS	Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Northwestern Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds. Avoid Removal or Degradation of Elderberry Shrubs and Avoid Vegetation Removal near Active Nest Sites.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Wild-22: Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects	N-A	NA	–	NI	NA	NI
	CP1–CP3	NA	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	–	PS	Mitigation Measure Wild-22: Implement Mitigation Measure Wild-21: Conduct Preconstruction Surveys for Elderberry Shrubs, Northwestern Pond Turtle, and Nesting Riparian Raptors and Other Nesting Birds. Avoid Removal or Degradation of Elderberry Shrubs and Avoid Vegetation Removal near Active Nest Sites.	LTS
Impact Wild-23: Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Long-term	Adverse effects on habitat for a variety of riparian-dependent special-status species	PS	Mitigation Measure Wild-23: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Wild-24: Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Long-term	Reduction in rate of bank erosion	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Wild-25: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife Along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Wild-26: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta	N-A	NA	–	NI	NA	NI
	CP1-CP5	Long-term	Goals of local and regional plans could be more difficult to attain	PS	Mitigation Measure Wild-26: Implement Mitigation Measure Bot-7: Implement a Riverine Ecosystem Mitigation and Adaptive Management Plan to Avoid and Compensate for the Impact of Altered Flow Regimes on Riparian and Wetland Communities.	LTS

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Impact Wild-27: Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes	N-A	NA	–	LTS	NA	LTS
	CP1-CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Cultural Resources						
Impact Culture-1: Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation	N-A	NA	–	NI	NA	NI
	CP1	Permanent	355 localities potentially containing historic-era remains and 212±54 prehistoric resources within inundation area	S	Mitigation Measure Culture-1: Develop and Implement measures identified in an NHPA Section 106 MOA or PA	LTS
	CP2	Permanent	371 localities potentially containing historic-era remains and 224±57 prehistoric resources within inundation area	S	Mitigation Measure Culture-1: Develop and Implement measures identified in an NHPA Section 106 MOA or PA.	LTS
	CP3–CP5	Permanent	391 localities potentially containing historic-era remains and 243±63 prehistoric resources within inundation area	S	Mitigation Measure Culture-1: Develop and Implement measures identified in an NHPA Section 106 MOA or PA.	LTS
Impact Culture-2: Inundation of Traditional Cultural Properties	N-A	NA	–	NI	NA	NI
	CP1–CP5	Permanent	–	S	Mitigation Measure Culture-2: Adverse effects will be avoided, minimized, or mitigated through project redesign, when warranted, or through the development and implementation of an MOA or PA.	SU

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Culture-3: Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction	N-A	NA	–	NI	NA	NI
	CP1-CP3	Permanent		NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Permanent	–	S	Mitigation Measure Culture-3: Implement Mitigation Measure Culture-1: Develop and Implement measures identified in an NHPA Section 106 MOA or PA.	LTS
Indian Trust Assets						
No impacts to ITAs were identified						
Socioeconomics, Population, and Housing						
Impact Socio-1 (No-Action): Potential for Reduced Employment Opportunities for Lower Sacramento River and Delta Area Residents Impact Socio-1 (CP1-CP5) Short-Term Increase in Population and Housing Demand in the Primary Study Area Resulting from Construction-Related Activities	N-A	Short-term	Potential periodic water and power supply disruptions	PS	NA	PS
	CP1–CP5	Short-term	Construction labor is expected to come from the local population	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Socio-2 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the Lower Sacramento River and Delta Area Impact Socio-2 (CP1–CP5): Short-Term Increases in Direct, Indirect, and Induced Employment in the Primary Study Area Related to Construction Activities	N-A	Temporary	Potential periodic water or power supply disruptions	PS	NA	PS
	CP1	Temporary	300 new construction jobs, 400 new indirect jobs, and 610 induced jobs	B	No mitigation needed; thus, none proposed.	B
	CP2	Temporary	300 new direct construction jobs, 600 new indirect jobs, and 600 induced jobs	B	No mitigation needed; thus, none proposed.	B
	CP3, CP4, & CP4A	Short-term	350 new direct construction jobs, 450 new indirect jobs, and 700 induced jobs	B	No mitigation needed; thus, none proposed.	B
	CP5	Short-term	360 new direct construction jobs, 470 new indirect jobs, and 710 induced jobs	B	No mitigation needed; thus, none proposed.	B
Impact Socio-3 (No-Action): Potential for Reduced Employment Opportunities for Residents Within the CVP and SWP Service Areas Impact Socio-3 (CP1–CP5): Potential for Temporary Reduction in the Labor Force of Related Industrial Sectors in the Primary Study Area as a Result of Direct Construction-Related Employment	N-A	Short-term	Potential water or power supply disruptions	PS	NA	PS
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Socio-4 (No-Action): Potential for Temporary Disruptions in Business and Industrial Activity in the CVP and SWP Service Areas Impact Socio-4 (CP1–CP5): Short-Term Increases in Direct, Indirect, and Induced Personal Income Paid to Employees in the Primary Study Area Hired for Construction-Related Activities	N-A	Temporary	Potential water or power supply disruptions	PS	NA	PS
	CP1	Short-term	$134.2 million in personal annual incomes in the local economic study area	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	$132.8million in personal annual incomes	B	No mitigation needed; thus, none proposed.	B
	CP3	Short-term	$153.3 million in personal annual incomes	B	No mitigation needed; thus, none proposed.	B
	CP4	Short-term	$154.2 million in personal annual incomes	B	No mitigation needed; thus, none proposed.	B
	CP4 A	Short-term	$154.3 million in personal annual incomes			
	CP5	Short-term	$156.5 million in personal annual incomes	B	No mitigation needed; thus, none proposed.	B
Impact Socio-5: Short-Term Increases in Sales and Profits for Businesses in the Primary Study Area that Support the Construction Industry	N-A	NA	–	NA	NA	NA
	CP1	Short-term	– (4.5-year construction period)	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial (5-year construction period)	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Short-term	Similar to CP1 & CP2, but more beneficial (5-year construction period)	B	No mitigation needed; thus, none proposed.	B

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Impact Socio-6: Short-Term Increase in State and Local Sales Tax Revenues in the Primary Study Area from Construction-Related Personal Income and Purchases	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Increased personal income, direct income and indirect and induced income during the construction period	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to, but more beneficial than CP1	B	No mitigation needed; thus, none proposed.	B
	CP3	Short-term	Similar to, but more beneficial than CP2	B	No mitigation needed; thus, none proposed.	B
	CP4-CP5	Short-term	Similar to, but more beneficial than CP3	B	No mitigation needed; thus, none proposed.	B
Impact Socio-7: Long-Term Reduction in the Adverse Economic Effects of Flooding in the Primary Study Area Impact Socio-8: Long-Term Increases in Direct Employment in the Primary Study Area Related to Project Operations	N-A	NA	–	NA	NA	NA
	CP1	Long-term	Reduced risk of flooding below Shasta Dam	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Similar to, but more beneficial than CP1	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Long-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
	N-A	NA	–	NA	NA	NA
	CP1–CP5	Long-term	Two or more new maintenance-related positions for the Shasta Dam facilities	B	No mitigation needed; thus, none proposed.	B

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Impact Socio-9: Potential Temporary Increase in Indirect Employment in Construction-Related Businesses of the Lower Sacramento River and Delta	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Temporary increase in short-term, construction-related, State sales and income tax revenues	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial than CP1	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Short-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
Impact Socio-10: Short-Term Increases in Sales and Profits for Businesses in the Lower Sacramento River and Delta Area That Support the Construction Industry	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Some local purchase of construction materials	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Short-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B
Impact Socio-11: Short-Term Increase in State Sales and Income Tax Revenues in the Lower Sacramento River and Delta Area from Construction-Related Personal Income and Purchases	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Short-term increase in State sales and income tax revenues	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Short-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Socio-12: Long-Term Reduction in the Adverse Economic Effects of Flooding in the Lower Sacramento River and Delta Area	N-A	NA	–	NA	NA	NA
	CP1	Long-term	Reduced risk of flooding below Shasta Dam	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Similar to CP1, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Long-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B
Impact Socio-13: Short-Term Increases in Sales and Profits for Businesses in the CVP and SWP Service Areas That Support the Construction Industry	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Some purchase of construction materials within the extended study area	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Short-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B
Impact Socio-14: Potential Temporary Reduction in Shasta Project Water or Hydropower Supplied to the CVP and SWP Service Areas During Construction	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Temporary shortages in water or hydropower caused by lowered reservoir levels during construction	PS	Mitigation Measure Socio-14: Secure Replacement Water or Hydropower During Project Construction.	LTS
	CP2	Short-term	Similar to CP1, but greater construction period duration	PS	Mitigation Measure Socio-14: Secure Replacement Water or Hydropower During Project Construction.	LTS
	CP3–CP5	Short-term	Similar to CP1 & CP2, but greater construction period duration	PS	Mitigation Measure Socio-14: Secure Replacement Water or Hydropower During Project Construction.	LTS

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Impact Socio-15: Short-Term Increase in State Sales and Income Tax Revenues in the CVP and SWP Service Areas from Construction-Related Personal Income and Purchases	N-A	NA	–	NA	NA	NA
	CP1	Short-term	Temporary increase in short-term, construction-related, State sales and income tax revenues	B	No mitigation needed; thus, none proposed.	B
	CP2	Short-term	Similar to CP1, but more beneficial than CP1	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Short-term	Similar to, but more beneficial than CP1 & CP2	B	No mitigation needed; thus, none proposed.	B
Impact Socio-16: Long-Term Increase in Agricultural Income and Jobs in the CVP and SWP Service Areas as a Result of Improved Water Availability and Reliability	N-A	NA	–	NA	NA	NA
	CP1	Long-term	Increased agricultural net income due to improved water reliability	B	No mitigation needed; thus, none proposed.	B
	CP2	Long-term	Similar to CP1, but more beneficial	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Long-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B
Impact Socio-17: Reduction in Risk of Potential Water and Power Shortages (and Related Economic Activity) in the CVP and SWP Service Areas as a Result of Long-Term Improvements to Water and Power Supply Reliability	N-A	NA	–	NA	NA	NA
	CP1	Long-term	Reduced risk of urban water and power shortages due to improved water reliability	B	No mitigation needed, thus none proposed.	B
	CP2	Long-term	Similar to CP1, but more beneficial			
	CP3–CP5	Long-term	Similar to CP1 & CP2, but more beneficial	B	No mitigation needed; thus, none proposed.	B

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Land Use and Planning						
Impact LU-1: Disruption of Existing Land Uses (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Short-term disruption of land uses of parcels around Shasta Lake and vicinity during construction and relocation activities; long-term disruptions of land use could also result from project operations.	PS	Mitigation Measure LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.	SU
	CP2	Short-term and long-term	Similar to CP1 but greater	PS	Mitigation Measure LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2 but greater	PS	Mitigation Measure LU-1: Minimize and/or Avoid Temporary Disruptions to Local Communities.	SU
Impact LU-2: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Inundation and relocation that could conflict with land use goals and policies	PS	Mitigation Measure LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.	SU
	CP2	Short-term and long-term	Similar to CP1 but greater	PS	Mitigation Measure LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.	SU
	CP3–CP5	Short-term And long-term	Similar to CP1 & CP2 but greater	PS	Mitigation Measure LU-2: Minimize and/or Avoid Conflicts with Land Use Goals and Policies.	SU

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

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Impact LU-3: Disruption of Existing Land Uses (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Impact LU-4: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	NA	–	NI	No mitigation needed; thus, none proposed.	NI
Recreation and Public Access						
Impact Rec-1 (No-Action): Increased Use of Shasta Lake Recreation Facilities and Demand for Recreation Opportunities on Shasta Lake and in the Vicinity Impact Rec-1 (CP1–CP5): Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation	N-A	Short-term	–	LTS	NA	LTS
	CP1	Short-term	99 affected facilities and infrastructure elements	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	122 affected facilities and infrastructure elements	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Short-term	163 affected facilities and infrastructure elements	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Rec-2 (No-Action): Increased Use and Demand for Recreation Opportunities on the Upper Sacramento River Impact Rec-2 (CP1– CP5): Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam	N-A	Long-term	–	LTS	NA	LTS
	CP1	Short-term	Affect access to local recreation activities during construction period	PS	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.	LTS
	CP2	Short-term	Similar to CP1, but longer construction period	PS	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.	LTS
	CP3–CP5	Short-term	Similar to CP1 & CP2, but longer construction period	PS	Mitigation Measure Rec-2: Provide Information About and Improve Alternate Recreation Access and Opportunities to Mitigate the Temporary Loss of Recreation Access and Opportunities During Construction at Shasta Dam.	LTS

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Impact Rec-3 (No-Action): Increased Use and Demand for Recreation Opportunities on the Lower Sacramento River and in the Delta Impact Rec-3 (CP1–CP5): Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir	N-A	Long-term	–	LTS	NA	LTS
	CP1–CP5	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-4 (No-Action): Increased Use and Demand for Recreation Opportunities in the CVP and SWP Service Areas Impact Rec-4 (CP1–CP5): Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone	N-A	Long-term	–	LTS	NA	LTS
	CP1	Long-term	Approximately 730 acres of newly inundated area would receive no vegetation treatment, 220 acres would have overstory removal, and 150 acres would have complete removal	S	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.	LTS
	CP2	Long-term	Approximately 1,167 acres of newly inundated area would receive no vegetation treatment, 350 acres would have overstory removal, and 240 acres would have complete removal	S	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.	LTS
	CP3–CP5	Long-term	Approximately 1,738 acres of newly inundated area would receive no vegetation treatment, 500 acres would have overstory removal, and 340 acres would have complete removal	S	Mitigation Measure Rec-4: Provide Information to Shasta Lake Visitors About Potential Safety Hazards in Newly Inundated Areas from Standing Timber and Stumps.	LTS

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Impact Rec-5 (CP1–CP5): Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Flow increases of <8 percent; inundation of small additional area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2,, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-6 (CP1–CP5): Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Flow increases of <8 percent; inundation of small additional area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-7 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Flow increases of <8 percent; inundation of small additional area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2, , but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3, but greater	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Rec-8 (CP1–CP5): Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Flow decreases of <7 percent; inundation of small additional area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3 but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-9 (CP1–CP5): Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures	N-A	NA	NA	NI	NA	NI
	CP1	Long-term	Provide enhanced sport angling opportunities for all four runs of Chinook salmon	B	No mitigation needed; thus, none proposed.	B
	CP2 & CP5	Long-term	Similar to CP1, but greater	B	No mitigation needed; thus, none proposed.	B
	CP3	Long-term	Similar to but greater than CP1 and less than CP2 & CP5	B	No mitigation needed; thus, none proposed.	B
	CP4	Long-term	Similar to but greater than CP1, CP2, & CP3	B	No mitigation needed; thus, none proposed.	B
	CP44	Long-term	Similar to but greater than CP1, CP2, & CP3, but less than CP4	B	No mitigation needed; thus, none proposed.	B
Impact Rec-10 (CP1–CP5): Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program	N-A	NA	–	NI	NA	NI
	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Short-term	Potential disruption during a 1-month period	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Rec-11 (CP1–CP5): Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites	N-A	NA	–	NI	NA	NI
	CP1–CP3	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Long-term	–	B	No mitigation needed; thus, none proposed.	B
Impact Rec-12 (CP1–CP5): Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Flows would increase but would remain below winter and spring high flows experienced in most years –	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-13 (CP1–CP5): Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Increased mean monthly flows within the extended study area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3, but greater	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Rec-14 (CP1–CP5): Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Increased mean monthly flows within the extended study area	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2 & CP4A	Long-term	Similar to CP1, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Long-term	Similar to CP1 & CP2, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Long-term	Similar to CP1, CP2, & CP3, but greater	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Rec-15 (CP1–CP5): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows	N-A	NA	–	NI	NA	NI
	CP1 & CP4	Long-term	Increased mean monthly flows within the extended study area	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS
	CP2 & CP4A	Long-term	Similar to but potentially greater than CP1	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

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Impact Rec-15 (CP1–CP5): Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows (contd.)	CP3	Long-term	Similar to but potentially greater than CP1 & CP2	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS
	CP5	Long-term	Similar to but potentially greater than CP1, CP2, & CP3	PS	Mitigation Measure Rec-15: Implement Mitigation Measure Aqua-15: Maintain Flows in the Feather River, American River, and Trinity River Consistent with Existing Regulatory and Operational Requirements and Agreements.	LTS
Aesthetics and Visual Resources						
Impact Vis-1: Consistency with Guidelines for Visual Resources in the STNF LRMP (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term and long-term	Degraded visual character and quality of primary study area	S	Mitigation Measure Vis-1: Amend the STNF LRMP to Include Revised VQOs for developments at Turntable Bay area.	SU
Impact Vis-2: Degradation and/or Obstruction of a Scenic View from Key Observation Points (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Scenic views obstructed or degraded in primary study area	S	Mitigation Measure Vis-2: Minimize Construction-Related Visual Impacts on Scenic Views From Key Observation Points.	SU
	CP2	Short-term	Similar to CP1, but greater (acres, miles, duration)	S	Mitigation Measure Vis-2: Minimize Construction-Related Visual Impacts on Scenic Views From Key Observation Points.	SU
	CP3–CP5	Short-term	Similar to CP1& CP2, but greater (acres, miles, duration)	S	Mitigation Measure Vis-2: Minimize Construction-Related Visual Impacts on Scenic Views From Key Observation Points.	SU

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Impact Vis-3: Generation of Increased Daytime Glare and/or Nighttime Lighting (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term and long-term	Increased glare in primary study area	S	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.	SU
	CP2	Short-term and long-term	Similar to CP1, but greater (amount, duration)	S	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.	SU
	CP3–CP5	Short-term and long-term	Similar to CP1 & CP2, but greater (amount, duration)	S	Mitigation Measure Vis-3: Minimize or Avoid Visual Impacts of Daytime Glare and Nighttime Lighting.	SU
Impact Vis-4: Consistency with Federal and State Scenic Highway Requirements (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Permanent	Visible from SR 151.	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Permanent	Similar to CP1, but greater vegetation removal would be visible	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Permanent	Similar to CP1 & CP2, but greater vegetation removal would be visible	LTS	No mitigation needed; thus, none proposed.	LTS

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Transportation and Traffic						
Impact Trans-1: Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	N-A	Long-term	–	LTS	NA	LTS
	CP1	Long-term	Increase in one-way trips per day throughout the primary study area	LTS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	CP1	Short-term	Increase in round trips per day	PS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	CP2	Long-term	Similar to CP1, but greater	LTS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	CP2	Short-term	Similar to CP1, but over a longer period	PS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	CP3–CP5	Long-term	Similar to CP1 and CP2, but greater	LTS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS
	CP3–CP5	Short-term	Similar to CP1 & CP2, but over a longer period	PS	Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan.	LTS

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Impact Trans-2: Adverse Effects on Access to Local Streets or Adjacent Uses in the Primary Study Area	N-A	NA	–	LTS	NA	LTS
	CP1	Permanent and/or temporary	Road closures and detours or partial road closures, or a combination of both, at Shasta Lake	PS	Mitigation Measure Trans-2: To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS
	CP2	Permanent and/or temporary	Similar to CP1, but over a longer period	PS	Mitigation Measure Trans-2: To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS
	CP3–CP5	Permanent and/or temporary	Similar to CP1 and CP2, but over a longer period	PS	Mitigation Measure Trans-2: To Reduce Effects on Local Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS
Impact Trans-3: Hazards in the Primary Study Area Caused by a Design Feature	N-A	NA	–	LTS	NA	LTS
	CP1	Permanent	Relocated road segments and vehicular and railroad bridges would be designed to current engineering design standards	B	No mitigation needed; thus, none proposed.	B
	CP2	Permanent	Similar to CP1, but more road segments and bridges would be replaced	B	No mitigation needed; thus, none proposed.	B
	CP3–CP5	Permanent	Similar to CP1 and CP2, but more road segments & bridges would be replaced	B	No mitigation needed; thus, none proposed.	B

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Impact Trans-4: Adverse Effects on Emergency Access in the Primary Study Area	N-A	NA	–	LTS	NA	LTS
	CP1	Temporary	Road closures may result in increased response times for emergency vehicles	PS	Mitigation Measure Trans-4: To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS
	CP2	Temporary	Similar to CP1, but for a longer period	PS	Mitigation Measure Trans-4: To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS
	CP3	Temporary	Similar to CP1 & CP2, but for a longer period	PS	Mitigation Measure Trans-4: To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS
	CP4–CP5	Temporary	Similar to CP3, but with gravel augmentation	PS	Mitigation Measure Trans-4: To Reduce Effects on Emergency Access, Implement Mitigation Measure Trans-1: Prepare and Implement a Traffic Control and Safety Assurance Plan	LTS

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Impact Trans-5: Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area	N-A	NA	–	LTS	NA	LTS
	CP1	Permanent	Increase in round trips per day	PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS
	CP2	Permanent	Similar to CP1, but greater	PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS
	CP3		Similar to CP1 & CP2, but greater	PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS
	CP4–CP5	Permanent	Similar to CP1, CP2, & CP3, but greater	PS	Mitigation Measure Trans-5: Identify and Repair Roadway Segments Damaged by the Project.	LTS
Impact Trans-6 (No-Action): Temporary Increase in Traffic in the Extended Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	N-A	Temporary	–	LTS	NA	LTS
	CP1–CP5	NA	–	NA	No mitigation needed; thus, none proposed.	NA
Impact Trans-7 (No-Action): Adverse Effects on Access to Local Streets or Adjacent Uses in the Extended Study Area	N-A	Temporary	–	LTS	NA	LTS
	CP1–CP5	NA	–	NA	No mitigation needed; thus, none proposed.	NA
Impact Trans-8 (No-Action): Hazards in the Extended Study Area Caused by a Design Feature	N-A	Temporary	–	LTS	NA	LTS
	CP1–CP5	NA	–	NA	No mitigation needed; thus, none proposed.	NA

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Impact Trans-9 (No-Action): Adverse Effects on Emergency Access in the Extended Study Area	N-A	Temporary	–	LTS	NA	LTS
	CP1–CP5	NA	–	NA	No mitigation needed; thus, none proposed.	NA
Impact Trans-10 (No-Action): Accelerated Degradation of Surface Transportation Facilities in the Extended Study Area	N-A	Temporary	–	LTS	NA	LTS
	CP1–CP5	NA	–	NA	No mitigation needed; thus, none proposed.	NA
Utilities and Service Systems						
Impact Util-1: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Abandon & relocate 31,000 feet of power lines, 33,000 feet of telecommunications lines	PS	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.	LTS
	CP2	Short-term	Abandon & relocate 36,000 feet of power lines, 36,000 feet of telecommunications lines	PS	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.	LTS
	CP3–CP5	Short-term	Abandon & relocate 39,000 feet of power lines, 39,000 feet of telecommunications lines	PS	Mitigation Measure Util-1: Implement Procedures to Avoid Damage to or Temporary Disruption of Service.	LTS

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Impact Util-2: Utility Infrastructure Relocation or Modification (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Abandon & relocate 31,000 feet of power lines, 33,000 feet of telecommunications lines	PS	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.	LTS
	CP2	Short-term	Abandon & relocate 36,000 feet of power lines, 36,000 feet of telecommunications lines	PS	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.	LTS
	CP3–CP5	Short-term	Abandon & relocate 39,000 feet of power lines, 39,000 feet of telecommunications lines	PS	Mitigation Measure Util-2: Adopt Measures to Minimize Infrastructure Relocation Impacts.	LTS
Impact Util-3: Short-Term Increase in Solid Waste Generation (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	176,627 cubic yards of solid waste	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Short-term	188,584 cubic yards of solid waste	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3	Short-term	219,889 cubic yards of solid waste	LTS	No mitigation needed; thus, none proposed.	LTS
	CP4 & CP4A	Short-term	Similar to CP3 but slight increase in solid waste generation	LTS	No mitigation needed; thus, none proposed.	LTS
	CP5	Short-term	Similar to CP4 but slight increase in solid waste generation	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact Util-4: Increases in Solid Waste Generation from Increased Recreational Opportunities (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Long-term	Increase in solid waste generated by recreationists	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Similar to CP1 but greater	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Long-term	Similar to but greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Util-5: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	TS	No mitigation needed; thus, none proposed.	TS
Impact Util-6: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NA	NA	NA
	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Util-7: Utility Infrastructure Relocation or Modification (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NA	NA	NA
	CP1–CP5	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI

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Impact Util-8: Short-Term Increase in Solid Waste Generation (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NA	NA	NA
	CP1–CP3	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
	CP4–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Util-9: Increases in Solid Waste Generation from Increased Recreational Opportunities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NA	NA	NA
	CP1–CP5	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
Impact Util-10: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NA	NA	NA
	CP1–CP5	Long-term	NA	TS	No mitigation needed; thus, none proposed.	TS

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Public Services						
Impact PS-1: Disruption of Public Services(Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	Risk of service disruption during construction	PS	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.	LTS
	CP2	Short-term	Similar to CP1, but greater construction duration & area	PS	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.	LTS
	CP3–CP5	Short-term	Similar to CP1 & CP2, but greater construction duration & area	PS	Mitigation Measure PS-1: Coordinate and Assist Public Services Agencies.	LTS
Impact PS-2: Degraded Level of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Short-term	– Risk of degraded level of public services during construction	PS	Mitigation Measure PS-2: Provide Support to Public Services Agencies.	LTS
	CP2	Short-term	Similar to CP1, but greater construction duration	PS	Mitigation Measure PS-2: Provide Support to Public Services Agencies.	LTS
	CP3–CP5	Short-term	Similar to CP1 & CP2, but greater construction duration	PS	Mitigation Measure PS-2: Provide Support to Public Services Agencies.	LTS
Impact PS-3: Relocation of Public Service Facilities (Shasta Lake and Vicinity and Upper Sacramento River)	N-A	NA	–	NI	NA	NI
	CP1	Long-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
	CP2	Long-term	Greater than CP1	LTS	No mitigation needed; thus, none proposed.	LTS
	CP3–CP5	Long-term	Greater than CP1 & CP2	LTS	No mitigation needed; thus, none proposed.	LTS

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Impact PS-4: Short-Term Disruption of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	NI	No mitigation needed; thus, none proposed.	NI
Impact PS-5: Degraded Levels of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Short-term	–	LTS	No mitigation needed; thus, none proposed.	LTS
Impact PS-6: Relocation of Public Services Facilities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	N-A	NA	–	NI	NA	NI
	CP1–CP5	Long-term	–	NI	No mitigation needed; thus, none proposed.	NI
Power and Energy						
Impact Hydro-1: Decrease in Shasta Powerplant Energy Generation	N-A,	Long-term	Increase in Shasta Powerplant energy generation	B	NA	B
	CP1–CP5	Long-term	Increase in Shasta Powerplant energy generation	B	No mitigation needed; thus, none proposed.	B
Impact Hydro-2: Decrease in CVP System Energy Generation	N-A,	Long-term	Decrease in energy generation of <1%	LTS	NA	LTS
	CP1–CP5	Long-term	<5% decrease in CVP system energy generation	B	No mitigation needed; thus, none proposed.	B

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Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact Hydro-3: Decrease in SWP System Energy Generation	N-A,	Long-term	Increase in SWP system energy generation	B	NA	B
	CP1, CP2, CP4 – CP5	Long-term	Increase in SWP system energy generation	B	No mitigation needed; thus, none proposed.	B
	CP3	Long-term	<5% decrease in SWP system energy generation	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Hydro-4: Increase in CVP System Pumping Energy Use	N-A,	Long-term	<5% increase in CVP energy system pumping energy use	LTS	NA	LTS
	CP1–CP5	Long-term	<5% increase in CVP energy system pumping energy use	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Hydro-5: Increase in SWP System Pumping Energy Use	N-A	Long-term	<5% increase in SWP energy system pumping energy use	LTS	NA	LTS
	CP1–CP5	Long-term	<5% increase in SWP energy system pumping energy use	LTS	No mitigation needed; thus, none proposed.	LTS
Impact Hydro-6: Decrease in Pit 7 Powerplant Energy Generation	N-A	Long-term	<5% decrease in Pit 7 Powerplant energy generation	NI	NA	NI
	CP1–CP5	Long-term	<5% decrease in Pit 7 Powerplant energy generation	LTS	No mitigation needed; thus, none proposed.	LTS

Notes:

[1] Alt = alternative. N-A = No-Action Alternative. CP = Comprehensive Plan.

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[3] NA = not applicable. "–" = the least impact among the action alternatives or an impact that is comparable in type and magnitude to the least impact among the alternatives.

[4] LOS = level of significance. B = beneficial. NA = not applicable. NI = no impact. LTS = less than significant. PS = potentially significant. S = significant. SU = significant and unavoidable.

[5] NA = not applicable, because under the No-Action Alternative, the Federal Government would not implement a plan to raise Shasta Dam, and no mitigation would be required.

Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Environmental Justice						
Impact EJ-1: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Vicinity of Shasta Lake	N-A	NA	–	NDHA	NA	NDHA
	CP1–CP5	Short-term	–	NDHA	No mitigation needed; thus, none proposed.	NDHA
Impact EJ-2: Potential Disproportionate High and Adverse Effect on Native American Populations from Disturbance or Loss of Sacred Locations in the Vicinity of Shasta Lake	N-A	NA	–	NDHA	NA	NDHA
	CP1–CP5	Short-term and long-term	–	DHA	No feasible mitigation is available to reduce impact.	DHA
Impact EJ-3: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Upper Sacramento River Area	N-A	Long-term	–	NDHA	NA	NDHA
	CP1–CP5	Long-term	–	NDHA	No mitigation needed; thus, none proposed.	NDHA
Impact EJ-4: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the Lower Sacramento River and Delta Area	N-A	NA	–	NDHA	NA	NDHA
	CP1–CP5	Long-term	–	NDHA	No mitigation needed; thus, none proposed.	NDHA
Impact EJ-5: Potential Disproportionate High and Adverse Effect on Minority and Low-Income Populations in the CVP/SWP Service Areas	N-A	NA	–	NDHA	NA	NDHA
	CP1–CP5	Long-term	–	NDHA	No mitigation needed; thus, none proposed.	NDHA

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Wild and Scenic River Considerations for McCloud River						
Impact WASR-1: McCloud River's Eligibility for Listing as a Federal Wild and Scenic River	N-A	NA	–	NI	NA	NI
	CP1	Permanent	11 percent of Segment 4 would be periodically inundated	S	No feasible mitigation available to reduce impact.	SU
	CP2	Permanent	21 percent of Segment 4 would be periodically inundated	S	No feasible mitigation available to reduce impact.	SU
	CP3–CP5	Permanent	39 percent increase over the current transition reach), inundating larger portion of the lower McCloud River and Segment 4	S	No feasible mitigation available to reduce impact.	SU
Impact WASR-2: Conflict with Shasta-Trinity National Forest, Land and Resource Management Plan	N-A	NA	–	NI	NA	NI
	CP1–CP5	Permanent	–	NI	No mitigation needed; thus, none proposed.	NI

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[4] LOS = level of significance. B = beneficial. NA = not applicable. NI = no impact. LTS = less than significant. PS = potentially significant. S = significant. SU = significant and unavoidable. TS = too speculative for meaningful consideration. NDHA = not disproportionately high and adverse. DHA = disproportionately high and adverse.
[5] NA = not applicable, because under the No-Action Alternative, the Federal Government would not implement a plan to raise Shasta Dam, and no mitigation would be required.

Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WASR-3: Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542	N-A	NA	–	NI	NA	NI
	CP1	Long-term	Increased inundation could affect the wild trout fishery (access and ecology) of the lower McCloud River identified in the State Public Resources Code.	PS	Mitigation Measure WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Fishery Protection, Restoration and Improvement Program for the Lower McCloud River Watershed.	PS
	CP2	Long-term	Similar to CP1, but greater inundation.	PS	Mitigation Measure WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Fishery Protection, Restoration and Improvement Program for the Lower McCloud River Watershed.	PS
	CP3–CP5	Long-term	Similar to CP1 and CP2, but greater inundation.	PS	Mitigation Measure WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Fishery Protection, Restoration and Improvement Program for the Lower McCloud River Watershed.	PS

Notes:

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Table S-3. Summary of Impacts and Mitigation Measures (contd.)

Resource Topic/Impact	Alt[1]	Impact Duration[2]	Quantification/ Relative Magnitude of Impact[3]	LOS Before Mitigation[4]	Mitigation Measure[5]	LOS After Mitigation[4]
Impact WASR-4: Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542	N-A	NA	–	NI	NA	NI
	CP1	Long-term	Increased inundation could affect the free-flowing conditions of the McCloud River, as identified in the State Public Resources Code.	S	Mitigation Measure WASR-4: Develop and Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed	SU
	CP2	Long-term	Similar to CP1, but greater inundation.	S	Mitigation Measure WASR-4: Develop and Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed	SU
	CP3–CP5	Long-term	Similar to CP1 and CP2, but greater inundation.	S	Mitigation Measure WASR-4: Develop and Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed	SU

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[5] NA = not applicable, because under the No-Action Alternative, the Federal Government would not implement a plan to raise Shasta Dam, and no mitigation would be required.

Key:

BLM = U.S. Bureau of Land Management
BMP = best management practice
CDFW = California Department of Fish and Wildlife
cfs = cubic feet per second
CO = carbon monoxide
CO_2e = carbon dioxide equivalent
CP = Comprehensive Plan
CRMP = Coordinated Resources Management Plan
CRPR = California Rare Plant Rank
CVP = Central Valley Project
dBA = A-weighted decibels
Delta = Sacramento–San Joaquin Delta
GHG = greenhouse gas
ITA = Indian Trust Assets
lb = pound
L_{eq} = equivalent noise level
LRMP = Land and Resource Management Plan
MOA = Memorandum of Understanding
MSCS = Multi-Species Conservation Strategy
NHPA = National Historic Preservation Act
NO_X = oxides of nitrogen
PA = Programmatic Agreement
PM = particulate matter
PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
$PM_{2.5}$ = respirable particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
ROG = reactive organic gas
SR = State Route
STNF = Shasta-Trinity National Forest
SWP = State Water Project
TBD = to be determined
USFS = U.S. Forest Service
X2 = distance in kilometers from the Golden Gate Bridge to the location where salinity concentration is 2 parts per thousand

Contents

Tables

Figures

Appendices

Abbreviations and Acronyms

°F	degrees Fahrenheit
µS/cm	microSiemens per centimeter
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
2004 NMFS BO	NMFS 2004 Biological Opinion on the Long-Term CVP and SWP Operations Criteria and Plan
2004 OCAP BA	Reclamation 2004 Long-Term CVP and SWP Operations Criteria and Plan Biological Assessment
2005 USFWS BO	USFWS 2005 Reinitiation of Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the CVP and SWP and the Operational Criteria and Plan to Address Potential Critical Habitat Issues
2008 Long-Term Operation BA	Reclamation 2008 Biological Assessment on the Continued Long-Term Operations of the CVP and SWP
2008 USFWS BO	USFWS 2008 Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the CVP and SWP
2009 NMFS BO	NMFS 2009 Biological Opinion and Conference Opinion on the Long-Term Operations of the CVP and SWP
AB	Assembly Bill
ABA	Architectural Barriers Act
ACID	Anderson-Cottonwood Irrigation District
ADA	Americans with Disabilities Act
AF	acre-feet
AFRP	Anadromous Fish Restoration Program
AFS	anadromous fish survival
Ag	Agricultural Water Service Contractor
Alquist-Priolo Act	Alquist-Priolo Earthquake Fault Zoning Act
Alt	alternative
APA	Administrative Procedure Act
APE	area of potential effect
AQAP	Air Quality Attainment Plan
ARB	Air Resources Board
ARPA	Archaeological Resources Protection Act of 1979
Avg	average
B	beneficial
BA	Biological Assessment

BAMM	best available mitigation measure
Banks	SWP Harvey O. Banks Pumping Plant
Basin Plan	Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
Bay Area	San Francisco Bay Area
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
BDCP	Bay Delta Conservation Plan
BIA	U.S. Department of the Interior, Bureau of Indian Affairs
BLM	U.S. Department of the Interior, Bureau of Land Management
BLMS	BLM sensitive
BMO	Basin Management Objective
BMP	best management practice
BO	Biological Opinion
BP	before present
BRCP	Butte Regional Conservation Plan
BST	Benchmark Study Team
BVWD	Bella Vista Water District
CAA	Federal Clean Air Act
CAAA	Federal Clean Air Act Amendments of 1990
$CaCO_3$	calcium carbonate
Cal EMA	California Emergency Management Agency
Cal Fire	California Department of Forestry and Fire Protection
CalEPA	California Environmental Protection Agency
Cal/OSHA	California Occupational Safety and Health Administration
CalEEMod	California Emissions Estimator Model
CALFED	CALFED Bay-Delta Program
Cal-IPC	California Invasive Plant Council
CalSim-II	California Water Resources Simulation Model II
Caltrans	California Department of Transportation
CBC	California Building Standards Code
CBDA	California Bay-Delta Authority
CCAA	California Clean Air Act
CCCSD	Clear Creek Community Services District
CCR	California Code of Regulations
CCSD	Centerville Community Services District
CCWD	Contra Costa Water District
CD	California Delisted
CDFA	California Department of Food and Agriculture

CDFW	California Department of Fish and Wildlife (formerly known as the California Department of Fish and Game [CDFG])
CE	California Endangered
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHP	California Highway Patrol
CMS	comprehensive mitigation strategy
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	combined objective
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	Coordinated Operations Agreement
County	Shasta County
County	Tehama County Department of Public Works
CP	California Fully Protected
CP	Comprehensive Plan
CRMP	coordinated resource management plan
CRPR	California Rare Plant Rank
CSA	community service area
CSAMP	Collaborative Science and Adaptive Management Process
CSC	California Species of Special Concern
CT	California Threatened
CVFPP	Central Valley Flood Protection Plan
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Federal Clean Water Act
CWHR	California Wildlife Habitat Relationship
CWP	cold-water pool
D-1275	State Water Board Water Rights Decision 1275

D-1379	State Water Board Water Rights Decision 1379
D-1641	State Water Board Water Right Decision 1641
dB	decibel
dBA	A-weighted decibel
dBA/DD	dBA per doubling of distance
DCC	Delta Cross Channel
DEIR	Draft Environmental Impact Report
DEIR/S	Draft Environmental Impact Report/Statement
DEIS	Draft Environmental Impact Statement
Delta	Sacramento-San Joaquin Delta
DHA	disproportionately high and adverse
diesel PM	diesel particulate matter
District Court	District Court for the Eastern District of California
DO	dissolved oxygen
DOC	California Department of Conservation
DOSS	Delta Operations for Salmonids and Sturgeon
DPS	Distinct Population Segment
Draft Feasibility Report	Shasta Lake Water Resources Investigation Draft Feasibility Report
DSC	Delta Stewardship Council
DSM2	Delta Simulation Model 2
DWR	California Department of Water Resources
E/I	export/inflow
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERP	Ecosystem Restoration Program
ESA	Federal Endangered Species Act
Exh	exhaust
FAC	facultative plants
FACU	facultative upland plants
FACW	facultative wetland plants
FB	Federal Bald and Golden Eagle Protection Act
FC	Federal candidate for listing
FD	Federally delisted
Federal WSRA	Federal Wild and Scenic Rivers Act

FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy and Management Act of 1976
FMMP	Farmland Mapping and Monitoring Program
FHA	Federal Highway Administration
FP	Federally petitioned for listing
FPD	Proposed for Federal delisting
FSSC	Forest Service Site Class
FSZ	Farmland Security Zone
FT	Federally listed as threatened
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
GAMA	Groundwater Ambient Monitoring and Assessment
General Industrial Permit	Industrial Stormwater General Permit
GHG	greenhouse gas
GIS	geographic information system
GW	Groundwater
GWh	gigawatt-hour
GWh/yr	gigawatt-hour per year
GWM	Groundwater Management
GWMP	Groundwater Management Plan
GWP	global warming potential
H&H	hydrology, hydraulics, and water management
HAP	hazardous air pollutant
HCP	Habitat Conservation Plan
HMBP	Hazardous Materials Business Plan
hp	horsepower
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
I-5	Interstate 5
ICOLD	International Commission of Large Dams
ID	Irrigation District
IFIM	Instream Flow Incremental Methodology
IFPSC	Interagency Fish Passage Steering Committee
IL4	Incremental Level 4
IMPLAN	IMpact analysis for PLANning
in/sec	inches per second
Interior	U.S. Department of the Interior
IRA	Inventoried Roadless Area

ITA	Indian Trust Assets
ITE	Institute of Transportation Engineers
Jones	CVP C.W. “Bill” Jones Pumping Plant
JPOD	joint points of diversion
KCSA	Keswick County Service Area
km	kilometer
KOP	key observation point
kV	kilovolts
L2	Level 2
L4	Level 4
lb	pound
lb/day	pounds per day
L_{dn}	day-night noise level
LEDPA	Least Environmentally Damaging Practicable Alternative
L_{eq}	equivalent noise level
L_{max}	maximum noise level
L_{min}	minimum noise level
LOS	level of significance
LRMP	Land and Resource Management Plan
LSR	Late Successional Reserves
LSSRP	Local Bridge Seismic Safety Retrofit Program
LSZ	low salinity zone
LTGen	LongTermGen, Version 1.18
LTS	less than significant
L_x	statistical descriptor
m	meter
M&I	municipal and industrial
MAF	million-acre feet
MBTA	Migratory Bird Treaty Act
MCV	Manual of California Vegetation
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MGCSD	Mountain Gate Community Services District
mgd	million gallons per day
mmhos/cm	millimhos per centimeter
MMT	million metric ton
MOA	Memorandum of Agreement
mph	miles per hour

MSCS	Multi-Species Conservation Strategy
msl	mean sea level
MT	metric ton
MW	megawatt
MWh	megawatt-hour
N	nitrogen
N-A	No-Action Alternative
N/A	not applicable
NA	not applicable
NAHC	Native American Heritage Commission
NAVD88	North American Vertical Datum of 1988
NDHS	not disproportionately high and adverse
NDOI	Net Delta Outflow Index
NED	National Economic Development
NEHRPA	National Earthquake Hazards Reduction Program Act
NEPA	National Environmental Policy Act
NFS	National Forest System
ng/L	nanograms per liter
NGVD29	National Geodetic Vertical Datum 1929
NHPA	National Historic Preservation Act
NI	no impact
NL	Not Listed
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_2	nitrate
NO_3	nitrite
NOA	Notice of Availability
NOD	north of Delta
NOI	Notice of Intent
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRA	National Recreation Area
NRCS	U.S. Natural Resources Conservation Service
NRDC	National Resources Defense Council
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
NSVAB	Northern Sacramento Valley Air Basin

ntu	nephelometric turbidity units
NWFP	Northwest Forest Plan
NWP	Nationwide Permit
OBL	obligate wetland plants
OCAP	Operations Criteria and Plan
OES	Governor's Office of Emergency Services
OHV	Off-Highway Vehicle
OMR	Old and Middle River
OPR	Governor's Office of Planning and Research
Oroville Facilities	Edward Hyatt Pumping-Generating Plant, Thermalito Diversion Dam Powerplant, and Thermalito Pumping-Generating Plant
ORV	outstandingly remarkable value
OSHA	Occupational Safety and Health Administration
P	phosphorus
P&G	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
PA	programmatic agreement
PCB	polychlorinated biphenyl
PCT	Project Coordination Team
PEIS/R	Programmatic Environmental Impact Statement/Environmental Impact Report
PG&E	Pacific Gas and Electric Company
PLSS	Public Land Survey System
PM	particulate matter
PM_{10}	respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
$PM_{2.5}$	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
PMF	probable maximum flood
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppm	parts per million
PPV	peak particle velocity
PRC	Public Resources Code
PS	potentially significant
PSD	New Source Review Prevention of Significant Deterioration
PUD	Public Utilities District
RABA	Redding Area Bus Authority
RAP	Road Analysis Process

RBPP	Red Bluff Pumping Plant
RCD	resource conservation district
RCRA	Resource Conservation and Recovery Act
RD-1641	State Water Board Revised Water Right Decision 1641
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
Recovery Plan	NMFS 2014 Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead
Ref	refuge
Refuge	Level 2 Federal Refuge
Reporting Rule	Greenhouse Gas Reporting Rule
Resources Agency	California Natural Resources Agency (formerly known as the California Resources Agency or State Resources Agency)
RHJV	Riparian Habitat Joint Venture
RM	River Mile
RMP	Resource Management Plan
RMS	root mean squared
ROD	Record of Decision
ROG	reactive organic gas
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
RPA	Reasonable and Prudent Alternative
RTS	reservoir triggered seismicity
RV	recreational vehicle
RWQCB	regional water quality control board
S	significant
S&M	Survey and Manage
SALMOD	SALMOD, Version 3.8
SB	Senate Bill
SCAQMD	Shasta County Air Quality Management District
SCC	Shasta County Code
SCFD	Shasta County Fire Department
SCSD	Shasta Community Services District
SCSO	Shasta County Sheriff’s Department
SCSO	Shasta County Sheriff’s Office
SCWA	Shasta County Water Agency

SDWA	Safe Drinking Water Act
SEL	single-event (impulsive) noise level
Settlement	Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.*
SHPO	State Historic Preservation Officer
SIP	State implementation plan
SJRRP	San Joaquin River Restoration Program
SLC	State Lands Commission
SLFPD	Shasta Lake Fire Protection District
SLWRI	Shasta Lake Water Resources Investigation
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMARA	California Surface Mining and Reclamation Act of 1975
SMM	standard mitigation measure
SO_2	sulfur dioxide
SOD	south of Delta
SR	State Route
SRA	shaded riverine aquatic
SRCA	Sacramento River Conservation Area
SRNWR	Sacramento River National Wildlife Refuge
SRTTG	Sacramento River Temperature Task Group
SRWRS	Sacramento River Water Reliability Study
SSI	sediment source inventory
SSLE	Security, Safety and Law Enforcement
State	State of California
State Parks	California Department of Parks and Recreation
State Water Board	State Water Resources Control Board
STATSGO	State Soil Geographic Database
STNF	Shasta-Trinity National Forest
STNF LRMP	Shasta-Trinity National Forest Land and Resource Management Plan
SU	significant and unavoidable
SVAB	Sacramento Valley Air Basin
SVI	Sacramento Valley Index
SWAP	Statewide Agriculture Production
SWP	State Water Project
SWP Power	State Water Project Power, BST April 2010 Version
SWPPP	Stormwater Pollution Prevention Plan
TAC	toxic air contaminants
TAF	thousand acre-feet

TBD	to be determined
TCD	temperature control device
TCFD	Tehama County Fire Department
TCP	Traditional Cultural Properties
TDS	total dissolved solids
Thermal Plan	Water Quality Control Plan for the Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California
TMDL	total maximum daily load
TNC	The Nature Conservancy
TS	too speculative for meaningful consideration
UC	University of California
Uniform Act	Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended
UPRR	Union Pacific Railroad
URBEMIS	2007 Urban Emissions model
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFS	U.S. Department of Agriculture, Forest Service
USFS E	USFS Endemic Species
USFS M	USFS Survey and Manage Species
USFS S	USFS Sensitive Species
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Geological Survey
VAMP	Vernalis Adaptive Management Plan
VAU	visual assessment unit
VdB	vibration decibel
VOC	volatile organic compound
VQO	visual quality objective
VRM	Visual Resource Management
WCD	Water Conservation District
WD	Water District
WDR	waste discharge requirements
WEPP	Watershed Erosion Prediction Project
Western	Western Area Power Administration
WOMT	Water Operations Management Team
WQCP	Water Quality Control Plan
WRIMS	Water Resources Integrated Modeling System
WSEL	water surface elevation

WSR	water supply reliability
WUI	wildland-urban interface
WWTP	Wastewater Treatment Plant
X2	2 parts per thousand isohaline

Chapter 25
Wild and Scenic River Considerations for McCloud River

This chapter describes the effects of the dam and reservoir modifications proposed under SLWRI action alternatives on the wild and scenic river values of the lower McCloud River, one of the major tributaries to Shasta Lake.

This chapter differs from the other chapters in this EIS in that it concerns only the McCloud River and does not discuss other portions of the primary study area nor the extended study area. The study area for this chapter consists of the lower McCloud River from the McCloud River Bridge to the confluence with Little Bollibokka Creek (Figure 25-1).

The primary focus of this chapter is the wild and scenic river values of the lower McCloud River, particularly the reach that would periodically be newly inundated if Shasta Dam and Shasta Lake were enlarged. The discussion and analysis concentrate on the values for which the McCloud River has been determined eligible for listing under the Federal Wild and Scenic Rivers Act ((Federal WSRA); Public Law 90-542, as amended; 16 U.S. Code 1271-1287) and for which a portion of the river is protected under the California Public Resources Code (PRC) Section 5093.542. Section 5093.542 was established through enactment of the California Wild and Scenic Rivers Act, as amended (Sections 5093.50 – 5093.70).

This chapter also differs from the other chapters in this EIS; it first provides background information and then discusses the regulatory framework to provide context for the affected environment section.

25.1 Background

Segments of the McCloud River have been determined eligible for listing under the Federal WSRA and are protected under the PRC. The river has not been formally listed as wild and scenic under either the Federal WSRA or PRC and is not part of either the national or State river system.

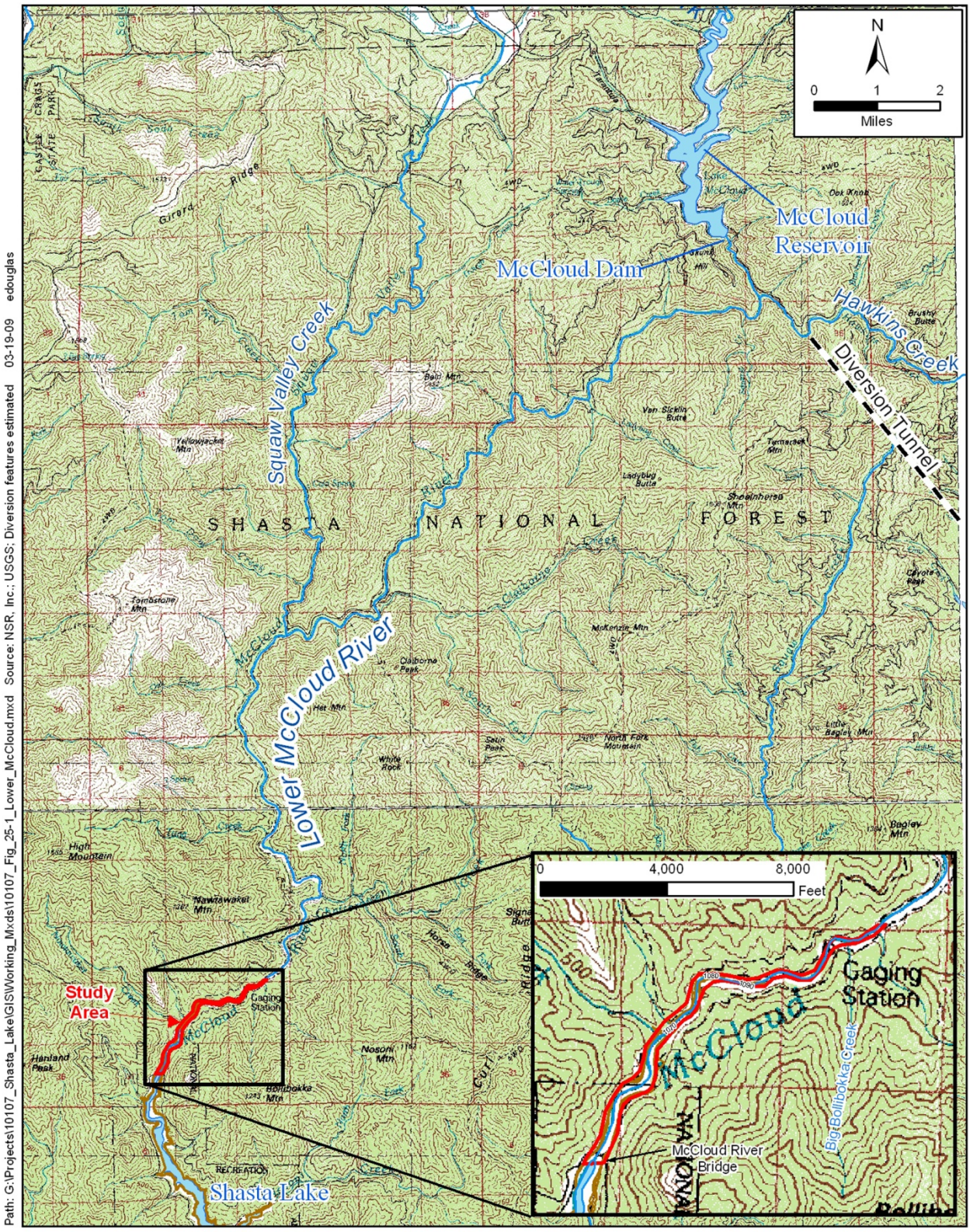

Figure 25-1. Lower McCloud River Study Area

The USFS evaluated the eligibility of the McCloud River for listing as wild and scenic under the Federal WSRA during preparation of the Shasta-Trinity National Forest (STNF) Land and Resource Management Plan (LRMP) in 1994 (USFS 1994). Although the LRMP found the McCloud River eligible for listing, the LRMP direction was to not formally designate any reach of the river as wild and scenic. Instead, the direction was to manage the lower McCloud River under a Coordinated Resource Management Plan (CRMP; USFS 1995a). The CRMP is a coordinated effort between landowners and stakeholders with a vested interest in the river. The CRMP requires its signatories to protect the outstandingly remarkable values (ORV) on lands they own or manage to ensure that the river remains eligible for Federal designation as wild and scenic. The CRMP contains a provision stating that the USFS reserves the right to pursue designation if the CRMP is terminated or fails to protect these values.

The California Natural Resources Agency (Resources Agency) evaluated the McCloud River in the late 1980s (Jones & Stokes Associates 1988) to determine whether it was eligible for listing under the PRC. The Resources Agency study found it eligible, but the California legislature declined to add the river to the California wild and scenic river system. The legislature instead passed an amendment to the California Wild and Scenic Rivers Act to protect the river's free-flowing condition and the river's fishery below McCloud Dam through the PRC.

As described in more detail under "Regulatory Framework," the PRC and Federal WSRA share several similar components: the establishment of a wild and scenic rivers system; the purpose of protecting certain rivers in their "free-flowing" condition; the identification of extraordinary or outstandingly remarkable values that make such rivers eligible for protection; a study process and procedure for including rivers in the system; and classifications of "wild," "scenic," and "recreational." Both the Federal WSRA and PRC prohibit new water impoundments on designated rivers, and both contain directives to government agencies to use their powers to further the policies of the legislation.

The Federal WSRA establishes a larger wild and scenic river corridor—typically at least 0.25 mile on each side of the river—than the PRC and requires Federal agencies to manage the public lands in the corridor to protect the river's free-flowing character and ORVs. In addition, the Federal agency managing rivers that are Federally designated as wild and scenic is required to develop and implement a management plan that will ensure the river's protection. In contrast, the PRC provides protection only to the first line of permanent riparian vegetation and does not require a management plan.

The length of the lower McCloud River that was determined to be eligible for wild and scenic river status differs between the Federal and State evaluations. The USFS defined the lower McCloud River more narrowly than the Resources Agency, considering the portion of the river that is currently periodically

inundated by Shasta Lake – referred to in this chapter as the *transition reach* – as part of the lake rather than part of the river. The USFS defined the lower river as extending from McCloud Dam downstream to an elevation of 1,070 feet mean sea level (msl) (approximately 22 total river miles), which corresponds to the current full-pool elevation of Shasta Lake. The Resources Agency's study report included approximately 5,400 feet of the existing transition reach (down to the McCloud River Bridge) as part of the lower river's segments (approximately 23 total river miles). Both the USFS and Resource Agency documents disclosed that this portion of the reach, protected under the State PRC, does not meet the definition of natural or free flowing because it is downstream of McCloud Dam and some portions of the river offer public access. It is important to note that CDFW designated the Wild Trout Management Area downstream to the boundary of The Nature Conservancy property; the management area did not extend downstream in the reaches primarily controlled by private fishing clubs. The public benefit component of the wild trout fishery is concentrated in the upper 7 miles of the lower McCloud River.

In its evaluation, the USFS divided the McCloud River into 10 segments encompassing 46 total river miles: three segments along the upper McCloud River (24 river miles above McCloud Reservoir) and seven segments along the lower McCloud River (22 river miles below McCloud Dam). Numbering of the upper McCloud River segments began at the headwaters and counted downstream, but numbering of the lower McCloud River segments began at the downstream extent and counted upstream. The USFS concluded that all 10 segments of the McCloud River were eligible for listing as a Federal wild and scenic river because they are free flowing, possess good water quality, and exhibit ORVs in the areas of cultural and historical resources, fisheries, geology, and scenic resources. Part of the lowermost segment – Segment 4 – would be periodically inundated if Shasta Lake is expanded. Segment 4 extends from about 5,400 feet upstream from the McCloud River Bridge, beginning at an elevation of 1,070 feet msl, to about Little Bollibokka Creek. The lower extent of this segment corresponds with the current full-pool elevation of Shasta Lake based on Reclamation geographic information system data. Figure 25-2 shows the downstream extent of Segment 4.

The Resources Agency's report also identified 10 segments, but its evaluation encompassed only 43 total river miles and the numbering of segments began at the headwaters and counted downstream along the entire river. The segments included six along the upper river (20 river miles above McCloud Reservoir) and four along the lower river (23 river miles below McCloud Dam). Eight of the 10 segments were determined eligible for State wild and scenic river status. Segment 10 extends from the McCloud River Bridge to the northern border of Section 9, Township 36 North, Range 3 West, which is just upstream from the river's confluence with Tuna Creek. Approximately 5,400 feet of the transition reach is included in Segment 10; the portion of the transition reach downstream

from the bridge was determined ineligible. The downstream extent of Segment 10 is shown on Figure 25-2.

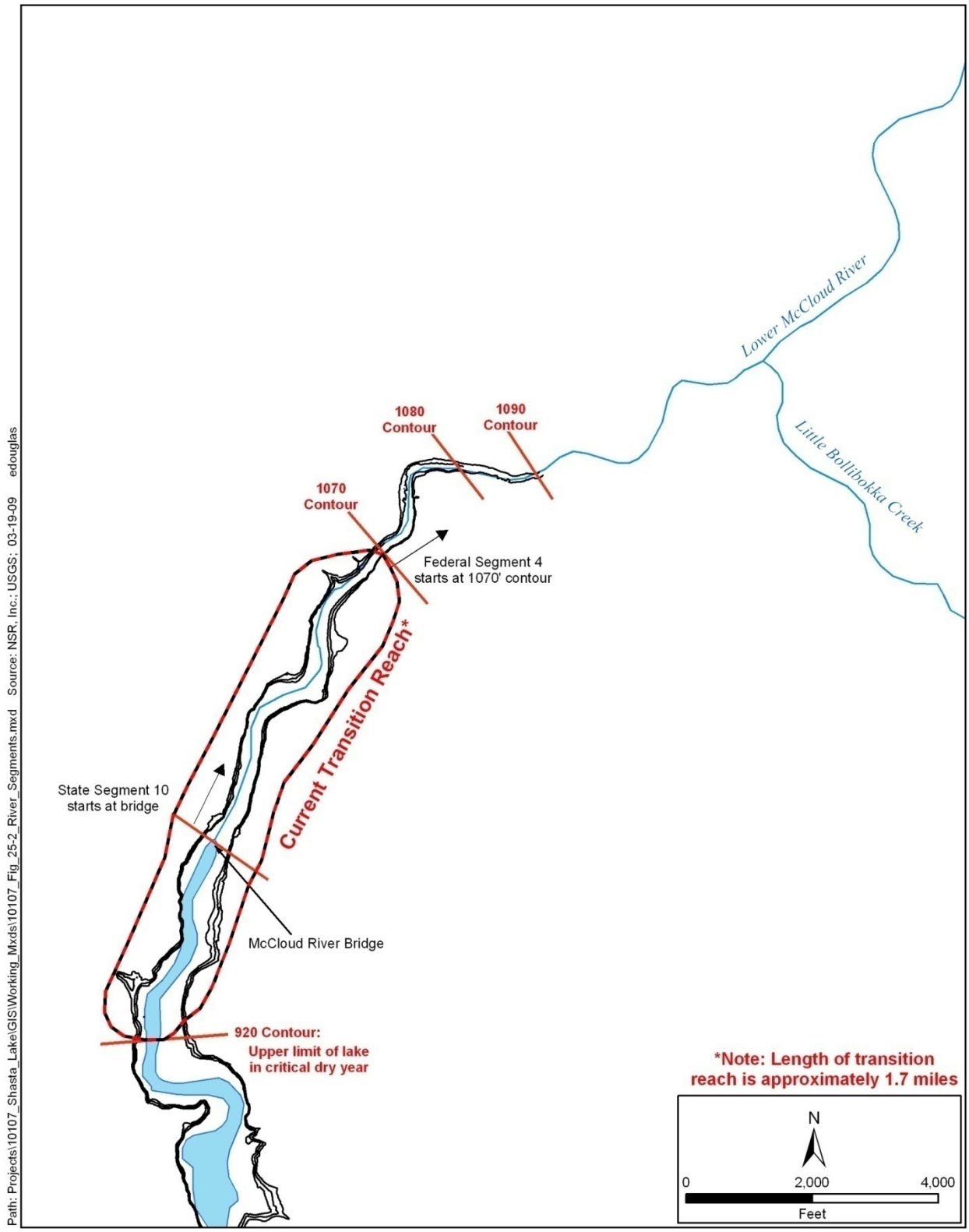

Figure 25-2. Differences in State and Federal Segments and Transition Reach

25.2 Regulatory Framework

25.2.1 Federal

Federal Wild and Scenic Rivers Act

The Federal WSRA, enacted in 1968, established the National Wild and Scenic Rivers System "to preserve rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations." To be eligible for inclusion in the system, a river must be free-flowing and exhibit ORVs. Free-flowing means "existing or flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway" (16 United States Code (USC) Section 1286). ORVs are scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (16 USC Section 1271). Depending on the specific conditions of a river, it may be designated as "wild," "scenic," or "recreation." Different segments of a single river can receive different designations; in other words, some segments can be designated wild, some scenic, and some recreation or combinations of these designations.

The Federal WSRA does not prohibit water developments that may affect portions of rivers that are eligible for inclusion in the National Wild and Scenic Rivers System. Section 5(d)(1) of the act does, however, require that in all planning for the use and development of water and related land resources, consideration be given to potential national wild, scenic, and recreational river areas by all Federal agencies involved.

Through the development and approval of the STNF LRMP, the USFS determined that segments of the McCloud River are eligible for inclusion in the national system; however, the river has not been formally designated and thus is not afforded protections under the Federal WSRA. Instead, the McCloud River CRMP was developed "to protect the [river's] unique and outstandingly remarkable features," thereby maintaining its eligibility.

The USFS evaluation concluded that the lower McCloud River, from McCloud Dam downstream about 22 miles to the river's transition to Shasta Lake at about 1,070 feet msl, provides outstanding cultural, fisheries, and geologic values, and its corridor has been classified as a highly sensitive visual area by the USFS (USFS 1994 and 1995b). The entire river corridor contains prehistoric and historic sites from past use by Indian tribes, late 1800 and early 1900 resorts, and evidence of historic logging. The lower river provides habitat for several salmonid species: bull trout/Dolly Varden (*Salvelinus confluentus*), which is believed to be extinct; rainbow trout (*O. mykiss*), which has been transplanted all over the world; and brown trout (*Salmo trutta*), a non-native species. Collectively, the rainbow and brown trout in the lower McCloud River are considered to be a "blue ribbon trout fishery" (USFS 1994). Outstanding geologic values include rock outcrops, cascades, and pools. Based on the ORVs,

the STNF determined that the lower McCloud River meets the eligibility requirements for designation under the Federal WSRA.

Shasta-Trinity National Forest Land and Resources Management Plan

The STNF LRMP is a forest-wide land use plan developed to guide resource management within the forest (USFS 1995b). For planning purposes, the STNF is divided into six land allocations for which specific management prescriptions are identified. The land allocations include Congressionally Reserved Areas, Late-Successional Reserves, Administratively Withdrawn Areas, Riparian Reserves and Key Watersheds, Matrix Lands, and Adaptive Management Areas. Management areas were identified within the STNF to establish management direction in response to the issues and resources of each distinct area. The Management Area defined for the McCloud River provides resource direction for recreational use, specifically fishing (i.e., fishery) and viewing waterfalls, and management of old-growth habitat. Management of the wild and scenic river ORVs of the McCloud River is deferred to the CRMP.

Coordinated Resource Management Plan

In 1990, certain public agencies and private parties with interests in the management of lands adjacent to the McCloud River executed a memorandum of understanding to pursue preparation of a CRMP. The memorandum was signed by representatives of the USFS, CDFW, The Nature Conservancy, Pacific Gas and Electric Company (PG&E), the Bollibokka Land Company, Crane Mills, McCloud River Co-Tenants, Sierra Pacific Industries, and the Hearst Corporation. In 1991, the same signatories, along with California Trout Inc., signed another memorandum of understanding to establish the framework for and approve the CRMP. The CRMP was adopted in July 1991. In 2007, the property owned by the Bollibokka Land Company was sold to Westlands Water District, which is not a party to the CRMP. Although Reclamation and representatives of Westlands Water District have attended periodic meetings with the CRMP members to provide updates on the SLWRI planning process, neither agency is a party to the CRMP.

The purpose of the CRMP is to protect the ORVs through coordinating the actions of signatory members on their individual properties. The CRMP has no authority, responsibility, or jurisdiction for protection of the ORVs beyond the actions of the signatory members on their properties. The CRMP provides a framework for coordinating management activities among the participants to ensure that the characteristics of the river that make it eligible for Federal wild and scenic river designation are protected.

Under the terms of the CRMP, the USFS “reserves the right to pursue [Federal wild and scenic river] designation” if the CRMP is terminated or significantly impaired or if it fails to protect the values that make the river suitable for such designation. This would occur if, for any reason, the actions of a signatory member of the CRMP on the signatory member’s land failed to protect the ORVs, as described in the CRMP Memorandum of Understanding.

25.2.2 State

California Public Resource Code, Sections 5093.50-5093.70

Sections 5093.50–5093.70 were added to the PRC in 1972, through enactment of the California Wild and Scenic Rivers Act, to preserve certain rivers that possess extraordinary scenic, recreational, fishery, or wildlife values in their free-flowing state. The PRC identifies, classifies, and provides protection for specific rivers or river segments, as approved by the legislature. Rivers or river segments that are specifically identified and classified in the PRC comprise the State Wild and Scenic Rivers System. As described in Section 5093.50, rivers or river segments included in the State system must possess "extraordinary scenic, recreational, fishery, or wildlife values"; the PRC does not define what constitutes "extraordinary."

Various amendments to the California Wild and Scenic Rivers Act have been passed, adding related legislation to the PRC. In 1986, Assembly Bill (AB) 3101 (Statutes 1986, Chapter 894) established a study process to help determine eligibility for potential additions to the State system (PRC Section 5093.547 and Section 5093.548). Additionally, protection for river segments can be provided without formally identifying them as part of the State system.

In 1989, an amendment to the California Wild and Scenic Rivers Act was passed, adding Section 5093.542 to the PRC to protect the McCloud River fishery, which it describes as "one of the finest wild trout fisheries in the state." It further declares that "The continued management of river resources in their existing natural condition represents the best way to protect the unique fishery of the McCloud River" and that "maintaining the McCloud River in its free-flowing condition to protect its fishery is the highest and most beneficial use of the waters of the McCloud River." The amendment provides protection to the McCloud River fishery and its "natural" and "free-flowing" condition from Algoma to the confluence with Huckleberry Creek (upper McCloud River), and 0.25 mile downstream from the McCloud Dam to the McCloud River Bridge (lower McCloud River). Although the Legislature declared that the McCloud River possessed "extraordinary resources" in the context of the PRC, the Legislature's action stopped short of formally designating the river as wild and scenic.

In addition, the State PRC is also relevant to the recently passed Proposition 1, "Water Bond. Funding for Water Quality, Supply, Treatment, and Storage Projects," for $7.5 billion, which includes $2.7 billion for storage projects. Proposition 1, section 79751 specifies:

> *Projects for which the public benefits are eligible for funding under this chapter consist of only the following:*
>
> *(a) Surface storage projects identified in the CALFED Bay-Delta Program Record of Decision, dated August 28, 2000,*

> *except for projects prohibited by Chapter 1.4 (commencing with Section 5093.50) of Division 5 of the Public Resources Code.*

Section 79751 does not amend or modify the State PRC. Whether the State of California can use Proposition 1 funds in support of any alternative potentially authorized related to enlargement of Shasta Dam and Reservoir is outside of Reclamation's authority and to be determined by the State of California.

Several key terms in the State PRC are used, but not fully defined with respect to protection of the McCloud River. This chapter adopts the definition of free-flowing as defined in the Federal Wild and Scenic Rivers Act. While the State PRC does not specifically define "Wild Trout Fishery", CDFW does identify several key elements that are relevant to and useful in developing a working definition of a wild trout fishery as it relates to this discussion. Fishery is a generally accepted term referring to an activity leading to the harvesting or use of a fishery resource (e.g., fishing, aquaculture) (CDFG 2003). It also includes a more inclusive definition that relates to the ecological conditions that provide fish habitat and self-sustaining populations (e.g., wild trout) (CDFG 2003).

25.3 Affected Environment

This section defines "affected environment" as the wild and scenic characteristics of the lower McCloud River that could be affected by the proposed modifications to Shasta Dam and Shasta Lake. It briefly describes the McCloud River from its headwaters to the McCloud Arm of Shasta Lake. It then describes the wild and scenic values of Segment 4 identified in the USFS evaluation and the values provided protection in the PRC.

Descriptions of the river and its characteristics were derived primarily from the following sources:

- Wild and Scenic Rivers Evaluation, Appendix E to the EIS for the Shasta-Trinity National Forest Land and Resources Management Plan (USFS 1994)
- Lower McCloud River and McCloud Arm Watershed Analyses (USFS 1998a and 1998b)
- McCloud River Wild and Scenic River Report (Jones & Stokes Associates 1988)
- Lower McCloud River Wild Trout Area Fishery Management Plan, 2004 through 2009 (Rode and Dean 2004)
- Lower McCloud River Habitat Typing Report (USFS 2001)

25.3.1 The McCloud River

McCloud River Basin

The McCloud River basin drains an area of approximately 800 square miles (USFS 1998a) in northern Shasta County and southern Siskiyou County, southeast of Mount Shasta. The river originates in an area of the STNF near Colby Meadows at approximately 4,250 feet above msl (Rode and Dean 2004). From its headwaters to Shasta Lake, the river is approximately 59 miles long. McCloud Reservoir, part of PG&E's McCloud-Pit Hydroelectric Project, separates the upper river from the lower river. The lower McCloud River transitions into the McCloud Arm of Shasta Lake upstream from the McCloud River Bridge (Figure 25-3).

Upper McCloud River

The upper McCloud River is an approximately 36-mile reach from the river's origins at Colby Meadows downstream to the transition with McCloud Reservoir. The river basin above the reservoir drains an area of approximately 403 square miles. Mean monthly flows in the upper McCloud River range from 766 cubic feet per second (cfs) in October to over 1,000 cfs in March, April, and May (PG&E 2006).

McCloud Reservoir

The McCloud Reservoir is a major component of PG&E's McCloud-Pit Hydroelectric Project, which was constructed in 1965 and operates under license from the Federal Energy Regulatory Commission (FERC). The McCloud Reservoir is approximately 5 miles long and has a storage capacity of approximately 35,200 acre-feet of water. The McCloud-Pit Hydroelectric Project diverts approximately 75 percent of the upper McCloud River's flow through a pipeline to Iron Canyon Reservoir, then conveys it downslope and discharges it into the Pit River at the Pit 6 powerhouse, upstream from the Pit River Arm of Shasta Lake (PG&E 2006). The remaining 25 percent of flows provide base flow for the lower McCloud River, a considerable reduction from historic flow volumes (Jones & Stokes Associates 1988).

Lower McCloud River

The lower McCloud River flows southwesterly through a deep canyon with steep slopes approximately 22 miles from McCloud Dam downstream to the transition with Shasta Lake. Vegetation along the lower river is predominately mixed-conifer and Douglas-fir forest. This stretch of river receives runoff from a 404-square-mile area of the lower McCloud River basin and the 95-square-mile Squaw Valley Creek basin. It provides exceptional fishing opportunities and includes two long-established fishing clubs, the Bollibokka Club and the McCloud River Club. The Nature Conservancy's McCloud River Preserve also encompasses a portion of the lower McCloud River.

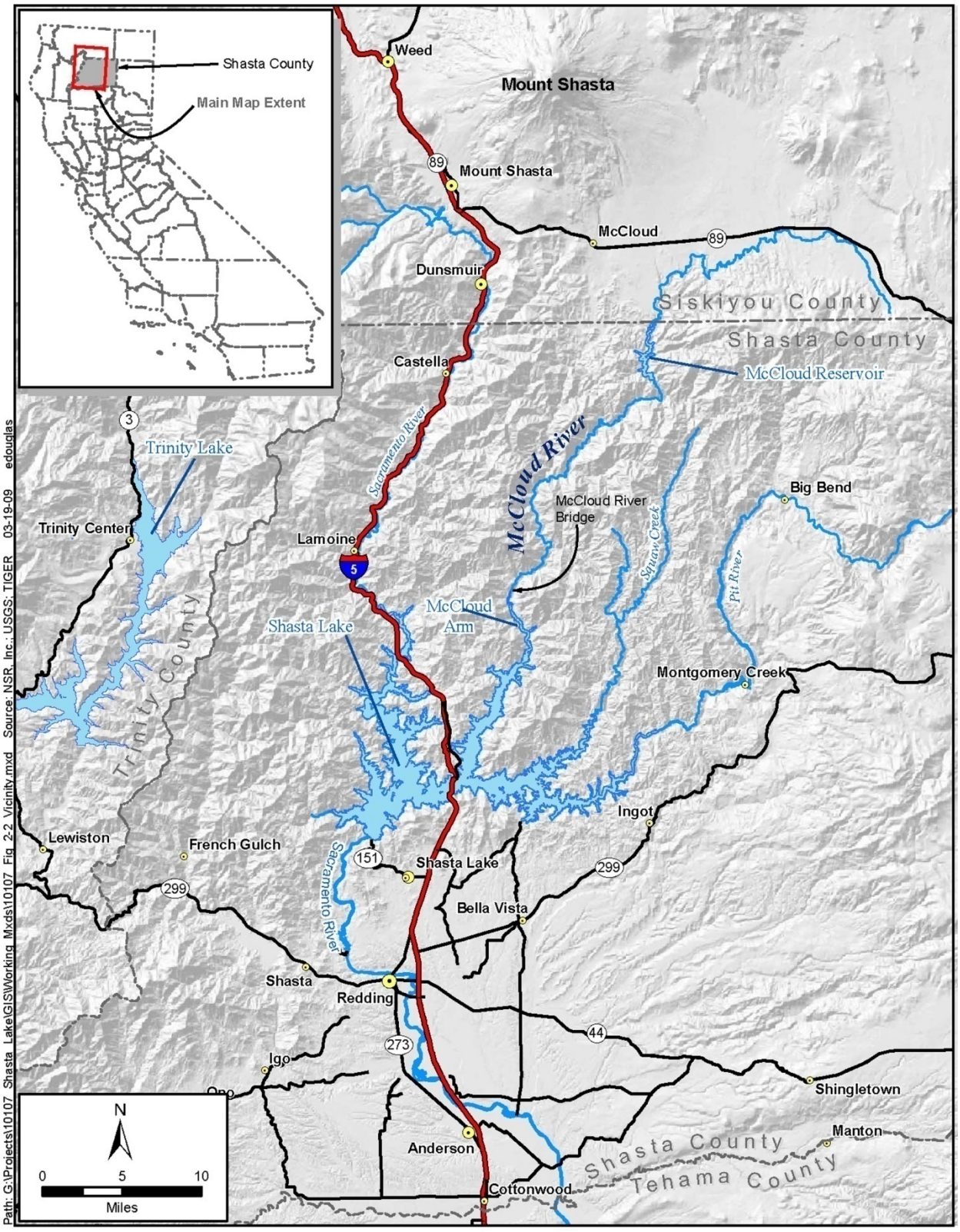

Figure 25-3. Regional Location

Flows in the lower McCloud River have been controlled by releases from McCloud Dam since 1965 (PG&E 2006). Under its current FERC license, PG&E's McCloud-Pit Hydroelectric Project maintains a minimum instream flow of 50 cfs from May through November and 40 cfs from December through April through controlled releases. Accordingly, flows in the lower McCloud River are highly regulated, and annual flows in the river below McCloud Dam do not follow a pattern typical of an unimpaired mountain river in northern California. Before dam construction, flows in the lower river were considerably higher, estimated to be in the range of 924 to 1,245 cfs (mean monthly flows) from June to October (Jones & Stokes Associates 1988, citing U.S. Geological Survey (USGS) for the period of 1967 to 1985).

McCloud Arm of Shasta Lake

The construction of Shasta Dam between 1938 and 1945 converted part of the lower McCloud River into the McCloud Arm of Shasta Lake. The McCloud Arm is more than 16 miles long, with approximately 70 miles of shoreline. It drains an area of approximately 41,000 acres (USFS 1998b). Water levels in the arm fluctuate with the lake's water levels, and during periods of lower water levels, a water line, known as the "bathtub ring," is evident along the banks; this bathtub ring extends about 1 mile upstream from the McCloud River Bridge. During extended periods of lower water levels, vegetation may become established on the exposed banks.

The upper extent of the lake encompasses the transition reach, which varies between about 920 and 1,070 feet msl. Because of the effects of Shasta Lake on the McCloud Arm, the STNF determined that the transition reach did not meet the eligibility requirements of a wild and scenic river (USFS 1994). The USFS defined the upper limit of the McCloud Arm as an elevation of 1,070 feet, or approximately 5,400 feet above the McCloud River Bridge. This elevation corresponds to the lower limit of Segment 4 as defined in the STNF LRMP. A portion of the transition reach – from the McCloud River Bridge to the 1,070-foot elevation – is included in the segments of the river provided protection under the PRC.

The transition reach provides a corridor for fish migrating between Shasta Lake and the lower McCloud River and contributes to the unique fishery of the river. Common fish in the McCloud Arm include native species such as rainbow trout, riffle sculpin, and speckled dace, as well as non-native species (e.g., brown trout, spotted bass) (North State Resources, Inc. 2008).

Water temperatures in the McCloud Arm become warmer as the river transitions to Shasta Lake. The warmer temperatures associated with Shasta Lake support warmwater fish, but the cooler temperatures of the transition reach may prevent some fish from migrating upstream into the lower river. Water temperatures in the transition reach may be suitable for warmwater species.

25.3.2 The McCloud River's Wild and Scenic Values

This section focuses on the wild and scenic river characteristics and ORVs of the lower McCloud River identified by the USFS in the wild and scenic river evaluation performed for the STNF LRMP (USFS 1994) and the wild and scenic river characteristics and extraordinary value protected under the PRC.

The McCloud River's fishery and its free-flowing condition are identified in both the USFS evaluation and the PRC. These characteristics are discussed first, followed by a discussion of the wild and scenic characteristics and values – water quality, geology, cultural/historical resources, and visual quality/scenery – that are identified only in the USFS evaluation.

Throughout the SLWRI planning process, Reclamation has worked closely with private landowners to collect information, perform technical investigations, and incorporate the best available science to support this EIS. Since the DEIS was prepared, information included in Chapters 11, 12, 13, and 25 of this EIS has been updated to include data from recent surveys and investigations performed on both Federal and private lands in the general vicinity of Shasta Lake. Reclamation worked closely with private land owners, including the signatories to the CRMP, to incorporate available information on the McCloud River into this EIS. The following section includes a brief description of the current transition reach (see Figure 25-1) because the reach of the river that would be newly inundated would likely take on the characteristics of the existing transition reach.

Fishery

The fishery of the lower McCloud River is unique; the river is considered a premier trout fishery and is managed according to CDFW's wild trout policy for the reach from Algoma Campground downstream to the lower end of the Nature Conservancy property, despite the ongoing effects of McCloud Dam and Shasta Lake on the river's flows and water quality, and the more recent impacts of the 2012 Bagley Fire on the lower McCloud River watershed. To characterize the fishery, this section includes descriptions of the aquatic habitat in USFS Segment 4, the Resources Agency's Segment 10, and the transition reach as well as the fish species that inhabit the study area.

Aquatic Habitat The lower McCloud River is characterized as a series of alternating riffles, pools, and cascading pocket water occurring along a broad, boulder-studded river channel within a confined, heavily timbered valley. A narrow band of montane riparian vegetation (typically less than 25 feet wide) dominated by willows, white alders, and Oregon ash occurs along the river banks adjacent to steep hill slopes with mixed conifer-Douglas-fir forest (USFS 2001).

In 2001, the USFS prepared a Habitat Typing Report to characterize aquatic habitats in the lower McCloud River from the McCloud River Bridge to McCloud Dam. The report divided the lower river into four reaches: McCloud

Dam to Ladybug Creek, Ladybug Creek to Clairborne Creek, Clairborne Creek to Tuna Creek, and Tuna Creek to McCloud River Bridge. The reach from Tuna Creek to McCloud River Bridge includes all of Segment 4 and nearly all of Segment 10, including the portion of the transition reach that is part of Segment 10. Data are not available for the transition reach below the McCloud River Bridge downstream to Shasta Lake.

The dominant aquatic habitat in the reach of the lower river from Tuna Creek to McCloud River Bridge includes runs (20 percent), mid-channel pools (18 percent), low-gradient riffles (18 percent), lateral scour pools from bedrock (11 percent), and pocket water (10 percent) (USFS 2001). This reach provides most of the corner pool (100 percent), glide (89 percent), and cascade (50 percent) habitats in the lower McCloud River.

The portion of the transition reach upstream from McCloud River Bridge is dominated by low-gradient riffles and mid-channel pools, with some pocket water, glides, runs, and lateral scour pools. Glide habitat is the dominant aquatic habitat between the 1,070-foot and 1,080-foot elevations, and pocket water is the dominant aquatic habitat between the 1,080-foot and 1,090-foot elevations. The habitat within the current transition reach represents a fraction of the total available aquatic habitat within the lower McCloud River and provides a small portion of the habitats within the reach from the McCloud River Bridge to Tuna Creek.

The diversity of riffles, flatwater habitat, and pools is influenced by the presence of boulders and cobble substrate and variations in flow conditions. The lower river is dominated by boulders with pockets of gravel present at pool tailouts and in velocity breaks behind large boulders. The riffles are generally higher gradient channel sections with turbulent surface flow and uniform cobble and boulder substrates. While swift pocket water in the lower McCloud River often appears more like a riffle than a run, the habitable eddies, or pockets, created behind the boulders that characterize this habitat type make it functionally more similar to the other flatwater habitats (USFS 2001). Typically, flatwater and pools are the principal habitats used by the trout in the McCloud River for rearing and feeding (Wales 1939, Rode and Dean 2004, USFS 2001).

The USFS (2001) reported that the aquatic habitat within the transition reach has undergone type conversions caused by aggradation and scour of sediments for about 3,700 feet upstream from the McCloud River Bridge. When Shasta Lake is drawn down, large, wide, low-gradient riffles with channel braiding dominate in this reach. When the lake is at full pool and at intermediate levels of drawdown, the transition reach becomes inundated, but a unidirectional current created by the lower McCloud River's inflow is detectable throughout the inundation zone, slowing as it approaches the flat water of Shasta Lake. To varying degrees, this fluctuating backwater effect converts this reach to a deep,

wide, slow-moving riverine habitat transitioning to lacustrine habitat near the bottom of the transition reach.

Fish Species The current composition and distribution of fish species inhabiting the lower McCloud River and Shasta Lake reflect the historic fishery, the operational effects of Shasta Dam and McCloud Dam, and the introduction of nonnative fish species into the river and Shasta Lake. The completion of Shasta Dam in 1945 eliminated all runs of anadromous fish in the river (Rode and Dean 2004). The historic fishery included Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*O. mykiss irideus*), rainbow trout, and the only known California occurrence of the bull trout. The bull trout is believed to have been extirpated from the lower McCloud River and is possibly extinct in California. Today, the fishery is dominated by rainbow trout and brown trout, an introduced species that migrates between Shasta Lake and the lower McCloud River. Other nonnative species also migrate up the lower McCloud River, including spotted bass (*Micropterus punctulatus*), but bass have not been confirmed upstream from Tuna Falls, a high-gradient rapid at the confluence with Tuna Creek. Despite the change in fish species in this 22-mile reach, the lower McCloud River is still considered one of California's premier trout streams.

Fish observed in the river downstream from the Tuna Creek confluence during a survey conducted in summer 2007 included rainbow trout, spotted bass, speckled dace (*Rhinichthys osculus*), sculpin spp. (*Cottus* spp.), Sacramento sucker (*Catostomus occidentalis*), and Sacramento pikeminnow (*Ptychocheilus grandis*) (North State Resources, Inc. 2008). Other fish that occur in this reach include brown trout, brook trout (*Salvelinus fontinalis*), hardhead (*Mylopharodon conocephalus*), and smallmouth bass (*Micropterus dolomieui*). The status of the riverine fish species of the lower McCloud River is identified in Table 25-1.

Rainbow Trout Fluvial and adfluvial populations of rainbow trout use the habitat available throughout the lower McCloud River. The McCloud River rainbow trout became known as "the rainbow of the fish culturist" because eggs from that population accounted for transplants of rainbow trout in the 1880s to the eastern states and several other countries.

The rainbow trout that inhabit the McCloud River are a vigorous, active fish that primarily inhabit swifter portions of pool and pocket water habitats. Adults migrate into the lower McCloud River from Shasta Lake in the spring and fall months, presumably to spawn. Suitable spawning habitat in the study area is limited, and the trout likely migrate further upstream to spawn (North State Resources, Inc. 2008).

Although the genetic origin of these fish has not been evaluated, the numerous strains of rainbow trout planted in Shasta Lake over the years have likely resulted in some introgression among migratory rainbow trout in the lower McCloud River. The degree to which this migratory population of rainbow trout

contributes to the native trout fishery of the river is not specifically known; however, available data do not indicate that it is substantial.

Table 25-1. Riverine Fish Species of the Lower McCloud River

Species	Current Status	Comments
Sacramento sucker (*Catostomus occidentalis*)	Common	Native, non-game species, observed during 2007 surveys
Riffle sculpin (*Cottus gulosus*)	Common	Native, non-game species, observed during 2007 surveys
Smallmouth bass (*Micropterus dolomieui*)	Uncommon	Introduced sport species in Shasta Lake, moves into lower river from lake, warmwater species
Spotted bass (*Micropterus punctulatus*)	Uncommon	Introduced sport species in Shasta Lake, moves into lower river from lake, observed during 2007 surveys, warmwater species
Hardhead (*Mylopharodon conocephalus*)	Uncommon	Native, non-game species
Rainbow trout (*Oncorhynchus mykiss*)	Abundant	Native trout species, subject to special angling regulations, coldwater species, observed during 2007 surveys
Sacramento squawfish (=pikeminnow) (*Ptychocheilus grandis*)	Common	Native, non-game species, observed during 2007 surveys
Speckled dace (*Rhinichthys osculus*)	Common	Observed during 2007 surveys
Brown trout (*Salmo trutta*)	Common	Introduced sport species found throughout the river, migrates from Shasta Lake to spawn in lower river, subject to special angling regulations, coldwater species
Bull trout (*Salvelinus confluentus*)	CE; Extinct	Native, believed extirpated from entire river by mid-1970s, a few restoration experiments performed in upper river tributaries, coldwater species
Brook trout (*Salvelinus fontinalis*)	Rare	Introduced sport species, stocking in upper river and tributaries discontinued, very rarely observed in lower river, coldwater species

Sources: Wales 1939, Tippets and Moyle 1978, Rode and Dean 2004, Moyle 2002, CDFW, unpublished data, North State Resources, Inc. 2008
Key:
CE = California Endangered
CDFW = California Department of Fish and Wildlife

Rainbow trout typically mature in their second to third year and move upstream to spawn in the lower McCloud River and its tributaries from February to June. The eggs typically hatch in 3 to 4 weeks, depending on water temperature, and fry emerge 2 to 3 weeks later. The fry remain in quiet waters close to shore, among cobbles, or under overhanging vegetation for several weeks. As the fish grow, they move into swifter water habitats.

In the river, this species forms feeding station hierarchies, which they aggressively defend, and prey on aquatic and terrestrial insects drifting in the current. They also eat active bottom invertebrates. It has been reported that

McCloud River rainbow trout tend to be more bottom-oriented when feeding than rainbow trout elsewhere.

In reservoirs, rainbow trout form loose schools and feed on both invertebrates and other fish, although fish dominate their diet as they grow larger. Preferred prey in Shasta Lake is the threadfin shad. Trout growth in Shasta Lake is more rapid than for fluvial trout. The optimum temperature range for growth and for completion of most life stages of rainbow trout is between 50 and 70 degrees Fahrenheit (°F), though they seem to prefer and thrive at temperatures in the lower two-thirds of this range. Rainbow trout in lakes and streams seldom live for more than 6 years.

Brown Trout Like the rainbow trout, fluvial and adfluvial populations of non-native brown trout use habitat throughout the lower McCloud River, but this species migrates more between the lake and river. It is not as abundant as the rainbow trout. CDFW biologists suggest that this species occupies an ecological niche previously occupied by bull trout in the lower McCloud River (Rode and Dean 2004).

Only some of the brown trout migrating from Shasta Lake that passed a lower river counting weir were observed upstream in the CDFW Wild Trout Management Area (Segments 7, 8, 9, and 10), so the actual extent of the spawning grounds of migratory brown trout is not fully known.

Brown trout mature in their second or third year. Some fish may mature in the river while others may migrate to Shasta Lake to feed, returning to spawn on a recurring basis. The stimulus for upstream migration is often a rise in stream flow or changing lake temperatures. Spawning takes place from November through December when water temperatures fall below 50°F. Eggs typically hatch within 7 to 8 weeks, depending on water temperature. Fry emerge from the gravel 3 to 6 weeks later. The habitats used by juvenile brown trout are similar to those used by rainbow trout; however, as brown trout grow, they tend to select habitats with slower water and more cover. In the riverine environment, brown trout prefer slow, deep pools with abundant boulder and bedrock ledge cover. The timing of emigration of juvenile brown trout to Shasta Lake is not known.

Fluvial brown trout have diets similar to those of rainbow trout, but appear to feed more on the stream bottom for benthic prey than rainbows. As brown trout grow, their diet expands to include larger invertebrate prey and fish. Larger brown trout are voracious predators, especially on fish, including young salmonids. In Shasta Lake, adult brown trout prefer threadfin shad as a staple prey.

Brown trout growth in the lower McCloud River appears to increase after age 3, which has been attributed to their migration to Shasta Lake to exploit the forage fish populations. Brown trout growth is best at temperatures ranging from 45 to

69°F, though they seem to prefer and dominate other trout species near the upper half of this range.

Spotted Bass and Smallmouth Bass Black basses and other sunfishes dominate in the littoral zones of Shasta Lake. Spotted bass and smallmouth bass are now the most common species of black bass in Shasta Lake, with spotted bass having become most frequent over the past 20 years. Both spotted and smallmouth bass occupy shallow, low-gradient habitat offered by Shasta Lake and its tributaries. They can be found throughout Shasta Lake and in the lower ends of the main tributary streams, including the lower McCloud River. However, the extent to which black bass have colonized the lower McCloud River is not currently known.

Smallmouth bass and spotted bass share similar life histories, and these similarities may account for their persistence in Shasta Lake compared to that of largemouth bass, which have declined in numbers. Both smallmouth and spotted bass mature in their second or third year and spawn in the late spring. Smallmouth will spawn at cooler temperatures (55 to 61°F) than spotted bass (greater than or equal to 65°F). Both species seek quiet shallow areas over mud, sand, gravel, and rocky, debris-littered bottoms to spawn in both lakes and streams. This type of spawning habitat is available in the transition reach of the lower McCloud River, especially when lake levels are high.

Juvenile bass feed on small invertebrates until they are large enough to prey on small fish and large invertebrates. Temperature preferences and optimal growth for both species of black basses is attained in the range from 68 to 81°F. Because of the year-round cool temperatures (less than or equal to 68°F) of the lower McCloud River, temperatures preferred by bass only occur during the late summer and early fall months upstream from the transition reach. Therefore, the temperature regime of the lower McCloud River may limit intrusions of bass from the lake. However, spotted bass were observed in the lower river below the confluence of Tuna Creek during summer fish surveys (North State Resources, Inc. 2008).

Free-Flowing Condition

The Federal WSRA defines *free flowing* as “existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway” (16 USC Section 1286). The PRC defines free-flowing as “existing or flowing without artificial impoundment, diversion, or other modification of the river.” It states, however, that the “presence of low dams, diversion works, and other minor structures does not automatically bar a river’s inclusion in the system.”

Base flows in the lower McCloud River are partially controlled by releases from McCloud Reservoir in accordance with PG&E’s FERC license and include precipitation and inflow from tributaries. The lower McCloud River experiences seasonal fluctuations and large variations in base flows (USFS 1998a). Releases

from McCloud Reservoir into the lower river are heavily regulated, with a minimum release requirement of 50 cfs from May through November and 40 cfs from December through April; the releases are typically well above these minimum requirements and tend to stay above 100 cfs (USFS 1998a). Tributary contributions are the most noticeable flows during storm events, but are substantially reduced during low-flow conditions. Because of the minimum release requirements from McCloud Reservoir, spring and summer flows are considerably more stable than they would be under unregulated conditions.

PG&E monitors lower McCloud River flows in accordance with its FERC license at a gaging station in Segment 4 upstream from Shasta Lake (0.2 mile downstream from Big Bollibokka Creek); the most recent available water data record covers the water year October 2012–September 2013 (USGS 2013). For this period, measured mean monthly flows ranged from 271 cfs in August to a high of 26,179 cfs in February, with maximum flows as high as 30,100 cfs on December 2, 2012.

Over the course of the year, the transition from lake to river expands and contracts over a distance of about 1.7 miles due to changing water levels in Shasta Lake (Figure 25-2). During April and May of wet years, the transition reach extends about 1 mile (5,400 feet) upstream from the McCloud River Bridge to the full pool elevation of 1,070 feet msl, the downstream boundary of Segment 4. As described in Chapter 6, “Hydrology, Hydraulics, and Water Management” Shasta Lake reaches full-pool elevation about one year in three.

Despite upstream and downstream dams and diversions, the lower McCloud River meets the definition of a free-flowing river under both the Federal WSRA and PRC.

Water Quality

The water quality of the lower McCloud River is influenced by natural processes and land use activities, including PG&E’s McCloud-Pit Hydroelectric Project, timber management activities, and roads. Overall, the water quality of the river is rated as good (USFS 1998). Glacial silt gives the river “a beautiful turquoise color typical of rivers draining glacial valleys in British Columbia and Alaska” (Jones & Stokes Associates 1998).

Turbidity and water temperature are two important factors that influence the water quality of the river and affect aquatic habitat. Turbidity is caused by suspended sediment transported from upstream waters and in surface runoff, particularly from disturbed landscapes, such as areas burned by fire, timber harvest areas or roads. Water temperature is affected by a variety of conditions, such as river flows, solar radiation, and density of vegetation along the river, but is closely tied to the temperature of the flows released from the McCloud Reservoir.

The turbidity of the lower McCloud River is influenced by the water quality and water levels of the McCloud Reservoir and runoff from upland areas throughout the basin. Turbidity levels are generally low during most of the year, ranging from 5–10 nephelometric turbidity units, but can spike to more than 900 units during periods of intense rainfall and flood flows (PG&E 2006).

Sediment becomes trapped at McCloud Dam and is released into the lower river during large storm events, temporarily increasing turbidity levels, especially in the upper segments of the lower river. Testing of the McCloud Dam bypass valve can cause high turbidity for a short period when sediment is discharged from the reservoir into the lower McCloud River. Surface runoff, especially after the first storms of the wet season, can contribute large amounts of turbid runoff from upland areas.

The length of the transition reach depends on the water year type. As the transition reach moves upstream, sediment within the reach is remobilized and turbidity levels respond accordingly. Periodic fluctuations in water levels can result in erosion along the banks and localized increases in turbidity levels in the transition reach and the McCloud Arm.

The year-round cool water temperature regime of the lower McCloud River inhibits the productivity of its fishery, but provides high-quality holding habitat for salmonids, contributing to the river's unique value as a tributary to Shasta Lake. The controlled releases from McCloud Dam appear to have a direct bearing on the water temperatures downstream. Water temperatures tend to be higher in Segment 4 than immediately below McCloud Dam. Data recorded at PG&E's monitoring station on the river just upstream from Shasta Lake (0.2 mile downstream from Big Bollibokka Creek) indicate that water temperature ranges from the high 30s to the upper 60s (°F), with lower temperatures in the winter and higher temperatures in the summer (PG&E 2006).

The infusion of cooler water from the lower McCloud River influences water temperatures in the transition reach throughout the year. The degree of influence depends on the amount of discharge from the river and Shasta Lake levels. The temperatures throughout the lower McCloud River also control to some degree the distribution of the warmwater fishery known to occupy the river below Tuna Falls.

Outstandingly Remarkable Values Identified in USFS Evaluation

Cultural/Historical Resources Cultural resources include archaeological sites, historical structures and sites, and areas of religious or cultural significance to Native Americans. Significant resources that provide important information on the prehistory and history of an area or that are considered sacred to Native Americans can contribute to wild and scenic river values.

The McCloud River basin was part of a major center of occupation by the Wintu people, who occupied the McCloud River area at the time of Euro-

American contact in the 1800s. Although much of the Wintu territory was overrun with miners and other opportunistic Euro-Americans, the lower McCloud River was left largely untouched due in part to a lack of easily mined materials and the ruggedness of the terrain (Yoshiyama and Fisher 2001), but also because of the resistance of the Wintu to incursions into their territory. Because of its generally undisturbed nature, the significance of the lower McCloud River to prehistoric and ethnographic records of this area of California's history is considered to be great (Jones & Stokes Associates 1988).

Within the 0.25-mile corridor deemed eligible by the USFS, three formally recorded sites and other known sites contribute to the lower river's ORVs because they provide important information on the use of the area from before the Late Archaic Period (1300 to 150 before present, calibrated using radiocarbon dating) to the Historic Era (1840 to present). Three Wintu villages, called Tsekerenwaitsogi, Klolwakut, and Boloibaki, are thought to have been located in the general area of the present-day Bollibokka Club headquarters (Guilford-Kardell 1980), which is part of the former Wintu territory. These villages likely represent the typical lifestyle of the Wintu at the time of Euro-American contact, when they lived in permanent villages near rivers and streams and were semi-sedentary, foraging people (DuBois 1935). As part of the Wintu occupation of this area, prehistoric, historic, and modern Traditional Cultural Properties, sacred locations, and important use areas are located throughout the lower McCloud River basin (outside of the 0.25 mile corridor), including features such as mountains, unique landforms, caves, distinctive rock outcrops, waterfalls, pools, springs, and resource gathering areas.

Point McCloud Bridge (known as McCloud River Bridge in this chapter) is a historical resource that was constructed in 1940 and altered in 1986; the bridge would be subject to relocation in conjunction with SLWRI activities. The Bollibokka Club is a historical resource located on the north bank of the river between the confluence of Big Bollibokka Creek on the east and Wittawaket Creek on the west. Buildings associated with the club were built between the 1860s and 1920s by Austin and Rueben Hills, the founders of Hill's Brothers Coffee, and previous owners (Lucas and Stienstra 2007). A log cabin dates from the 1860s, and other structures date from the ownership of the Hills Family, including the clubhouse built in 1924 and a structure built of river cobble in 1915 (Whitney 2004). Although these resources could be eligible for listing on the National Register of Historic Places, they have not been formally evaluated.

The fishery of the lower McCloud River was also very important to prehistoric and historic uses of the area. The Native Americans in the lower McCloud River basin conducted communal fish drives of salmon or steelhead at night, which brought together many communities and provided opportunities for trade and social networking, including the parsing out of the catch among the people and villages involved (DuBois 1935). Fish, including salmon, steelhead, Sacramento sucker, freshwater shellfish, and lamprey, were an important part of the Native American diet in this area. When the northern mines opened in the 1800s,

settlers moved into the area, and the McCloud River and other rivers' fisheries provided important sources of food. In the early years of settlement, fish and game in the area were used for subsistence; however, this changed with the formation of the State of California and increased fishery management and recreational fishing.

Geology The lower McCloud River flows through a number of geologic formations, including the McCloud Limestone formation. This formation contains fossilized remains of invertebrate and vertebrate fauna that provide important scientific information on the history of California, and it has a high potential for research. According to the USFS (1998b), the limestone features exposed at a number of locations around Shasta Lake are unique and contribute to worldwide paleontological knowledge. The McCloud Limestone contains 36 species of corals, some of which may form the basis of a new taxonomic group.

Because of its very diverse fossil faunas, the mountainous terrain between the McCloud and Pit arms of Shasta Lake is perhaps California's single most important area for paleontological research (Munthe and Hirschfield 1978, cited in USFS 1998b). The limestone outcrops on the ridge immediately northwest of McCloud River Bridge (several hundred vertical feet above Shasta Lake) have produced several large Mississippian and Pennsylvanian invertebrate faunas. Because this period is poorly represented on the West Coast, this fossiliferous limestone is important to understanding the late Paleozoic evolution in this part of the country (USFS 1998b). Limestone outcrops adjacent to the McCloud Arm also provide habitat for several special-status species, such as Shasta salamander, Shasta eupatorium, Howell's cliff-maids, and Shasta snow-wreath (Reclamation 2003).

Exposed outcrops of the limestone formation are visible from the lower McCloud River in and upslope of the transition reach and contribute to its scenic values.

Visual Quality/Scenery The visual setting of the lower McCloud River upstream from Shasta Lake includes views of the river, limestone rock outcrops, adjacent coniferous and oak forests, and infrastructure associated with the Bollibokka and McCloud River clubs. A USGS stream gage has also been in place for a number of years. The pristine nature of the lower river provides for high-quality scenic views. However, the scenic views of the lower McCloud River are enjoyed by only a limited number of viewers, consisting primarily of private landowners, club members, and their guests.

Views of the river include "picturesque cascading whitewater, and deep, long, green- or turquoise-colored pools," with Douglas-fir and black and canyon oaks dominating the steep slopes and hillsides along the river (Jones & Stokes Associates 1988). Several buildings are present at the Bollibokka Club headquarters, but these structures blend in with the visual setting. The transition reach exhibits some evidence of fluctuating surface water elevations associated

with changes in water levels of Shasta Lake. Areas that are noticeably affected by the reservoir levels exhibit "a bathtub ring of steep, treeless slopes with occasional deposits of alluvium."

The scenic views make most of the lower McCloud River, including Segment 4, eligible as a scenic river under the Federal WSRA (USFS 1994). To be classified as a scenic river, the river must be free of impoundments, be accessible in places by roads, and have a river basin/shoreline that is largely undeveloped. Segment 4 does not contain any human-made or other impoundments that affect its free-flowing conditions. Roads to the Bollibokka Club provide access to portions of Segment 4 for members of the club and their guests. Currently, public access is limited to pedestrians on USFS lands along the shoreline of Shasta Lake. For these reasons, the USFS has determined that this segment meets the eligibility requirements of a scenic river under the Federal WSRA.

25.4 Environmental Consequences and Mitigation Measures

This section identifies how the characteristics of the lower McCloud River that make it eligible for listing under the PRC and Federal WSRA could be affected by each alternative and whether the alternatives would conflict with the provisions of the STNF LRMP and the CRMP.

25.4.1 Methods and Assumptions

This analysis of environmental consequences focuses on the effects of proposed modifications to Shasta Dam and Shasta Lake on the McCloud River's free-flowing conditions, its water quality, and the ORVs (cultural resources, fisheries, geology, and scenery) that make it eligible for listing as a wild and scenic river under the Federal WSRA. In large part, the environmental effects are based on computer modeling of water levels, known elevations of the existing bathtub ring that is observable in the transition reach, and the anticipated changes in the environment due to fluctuations in water levels and expansion of the transition reach. Physical effects to the free-flowing conditions, water quality, and ORVs are analyzed in terms of their effects on the eligibility of the river for wild and scenic river designation. While aquatic habitat data are used to quantify the relative impact to the fishery values, a qualitative analysis is provided for most resources because of a lack of quantitative data and the subjective nature of the values. Information to support the analysis was generated from available literature and planning documents and technical studies prepared as part of the SLWRI as well as other chapters in this EIS.

CalSim Modeling

The CalSim-II computer model was used to assist in the evaluation of the potential impacts of the project alternatives on water-related resources. The model used historical data on California hydrology to represent the variety of

weather and hydrologic patterns, including wet periods and droughts, under which water storage and conveyance facilities would be operated. Two scenarios (base cases) of demands for, and storage and conveyance of, water were used in model runs: 2005 facilities and demands ("existing conditions") and forecasted 2030 demands and reasonably foreseeable projects and facilities ("future conditions"). A model run was conducted for each of these base cases combined with each alternative so that the effects of the No-Action Alternative and the action alternatives could be evaluated for both existing and future conditions.

The analysis focuses on the environmental effects in the portion of Segment 4 that would periodically be inundated. These effects are discussed in the following section.

Gage Data

PG&E, in coordination with USGS, monitors lower McCloud River flows in accordance with its FERC license for the McCloud-Pit Hydroelectric Project at a gaging station just upstream from the McCloud River Bridge, approximately 0.2 mile downstream from Big Bollibokka Creek (USGS 11368000 McCloud River above Shasta Lake, California). The station measures mean, minimum, and maximum monthly flows in the lower McCloud River. The most recent available water data record covers the water year of October 2012 to September 2013 (USGS 2013). This data was used to describe flow conditions in the lower McCloud River.

Water Quality Monitoring

Current and historical water quality monitoring data for the McCloud River have been collected by Federal and state agencies as well as PG&E and The Nature Conservancy. The California Department of Water Resources maintains water quality information on the McCloud River in the California Data Exchange Center database. The Nature Conservancy monitors water quality at the McCloud River Preserve. Water quality monitoring of the lower McCloud River includes measures of water temperature, dissolved oxygen, pH, specific conductance, and turbidity, as well as correlated data on weather, air temperature, and debris movement. PG&E monitors water quality in compliance with its FERC license. Available information on water quality was used to describe the setting of the lower river and assess changes in water quality that would occur as a result of the Shasta Dam modification alternatives.

Habitat Typing

The USFS stream habitat typing performed in 1999 and 2000 (STNF, December 2001 unpublished data report, as found in USFS 2001) was used to describe aquatic habitat in the lower McCloud River and to assess the changes in aquatic habitat from implementation of the Shasta Dam modification alternatives. The habitat typing data were used in conjunction with the CalSim-II modeling results, digitized orthophotographs, and high-resolution topographic data to provide habitat maps and graphic depictions of the distribution of aquatic

habitat in the lower river below Little Bollibokka Creek. A longitudinal profile, using water surface elevations, was generated to illustrate habitats; it does not provide an accurate representation of channel geometry.

A quantitative evaluation of the aquatic habitats was performed using digital images and the USFS habitat typing data in an integrated geographic information systems environment. Longitudinal habitat delineation was determined from the habitat typing data, with minor adjustments to match photo-interpreted habitat, and incorporated into the geographic information systems in conjunction with water surface elevations generated through the CalSim-II modeling results. Estimates of aquatic habitat areas were generated from digitized wetted stream perimeters. These measurements were based on orthophotographs taken April 25, 2001. While the absolute amount of riverine habitat can vary with flow, the relative proportions of different types of habitat remain relatively constant. Therefore, we used the relative proportions of aquatic habitat types to compare impacts to the transition reach with the entire lower river.

25.4.2 Criteria for Determining Significance of Effects

The following significance criteria were developed based on guidance provided by the State CEQA Guidelines, other Federal and State guidance, and consider the context and intensity of the environmental effects as required under NEPA. (Please see Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences) for an explanation of the distinction between significance under NEPA and significance under CEQA.) Impacts of an alternative on the wild and scenic river values of the lower McCloud River would be significant if project implementation would:

- Affect the eligibility for Federal listing as a wild and scenic river of any portion of the lower McCloud River above the 1,070-foot elevation
- Conflict with the STNF LRMP or with management of the McCloud River under the CRMP
- Impact the wild trout fishery and free-flowing conditions as described in the State PRC

25.4.3 Direct and Indirect Effects

No-Action Alternative

Under the No-Action Alternative, Reclamation would not pursue an action to enlarge Shasta Dam to help increase anadromous fish survival in the upper Sacramento River and address the growing water supply reliability issues in California. Water levels in Shasta Lake and the transition reach would continue to fluctuate similar to current conditions. USFS Segment 4 and the Resources Agency's Segment 10 would not be affected by this alternative.

Impact WASR-1 (No-Action): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Under the No-Action Alternative, the current maximum elevation of water levels in the transition reach would not be increased, and Segment 4 would not be affected. Fluctuations in water levels would continue to be similar to current conditions, with water levels reaching the maximum elevation of 1,070 feet msl – the downstream boundary of Segment 4 – in the transition reach for a brief period (typically a few days in May) during wet years.

The average monthly water surface of Shasta Lake would continue to fluctuate based on the water year, with a maximum elevation of 1,053 feet msl in April of an average water year and 1,070 feet msl in April and May of a wet year. These fluctuations would not affect the free-flowing conditions and water quality of Segment 4. The ORVs that make the river eligible for designation as a Federal wild and scenic river would continue to be affected only by ongoing natural processes and land use activities, and all of Segment 4 would remain eligible for listing under the Federal WSRA. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-2 (No-Action): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan Under the No-Action Alternative, the STNF LRMP would continue to be implemented as it has in the past, with no changes in the management of the McCloud River's free-flowing condition, water quality, and ORVs. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-3 (No-Action): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 Under the No-Action Alternative, the protections afforded the McCloud River by the PRC would not be affected. River conditions would not be modified, and the provisions of the PRC would continue to protect the river. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

Impact WASR-4 (No-Action): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 Under the No-Action Alternative, the protections afforded the McCloud River by the PRC would not be affected. River conditions would not be modified, and the provisions of the PRC would continue to protect the river. Therefore, there would be no impact. Mitigation is not required for the No-Action Alternative.

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

CP1 would involve a 6.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 8.5 feet and enlarge the total storage space in the lake by 256,000 acre-feet. This increase would equate to an increase of about 1,100

acres of surface area occupied by Shasta Lake when the lake is full. CP1 includes measures to increase water supply reliability while contributing to increased survival of anadromous fish. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 70,000 acre-feet and 35,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing municipal and industrial (M&I) deliveries.

Impact WASR-1 (CP1): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Under CP1, the increased gross pool of Shasta Lake would expand the current transition reach up to the 1,078-foot elevation, resulting in adverse effects on the characteristics of approximately 1,470 feet of Segment 4. The rest of the McCloud River would remain eligible for designation as a Federal wild and scenic river. This impact would be significant.

Under CP1, approximately 1,470 feet, or 11 percent, of Segment 4 would be periodically inundated. This increase in the transition reach to a maximum elevation of 1,078 feet msl would equate to a 16 percent increase over the current transition reach. The length of time during the year when the transition reach is inundated and the maximum elevation of the inundation area would vary by the type of water year (wet, above normal, below normal, average, dry, or critical).

Within the expanded transition reach, flow conditions and fisheries would periodically be affected, with the timing and duration of the effects similar to those that occur in the current transition reach. Over time, the expansion of the bathtub ring would affect water quality, geology, and visual quality/scenery in the affected portion of Segment 4. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans. These effects could reduce the total length of the lower McCloud River that is eligible for wild and scenic river designation by about 1,470 feet (approximately 1.2 percent of the total length of the lower river).

Free-Flowing Conditions Under CP1, the currently free-flowing section of the lower McCloud River would be reduced by about 1,470 feet or about 1.2 percent. The flow characteristics of the affected portion of Segment 4 would periodically be modified, resulting in slower moving waters and a wider river channel. When inundated, the affected portion would retain some current, but flow velocities would decrease with distance downstream. This modification would not meet the definition of a free-flowing river under the Federal WSRA.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 1,470-foot reach of Segment 4 that would be affected by CP1 would become ineligible for listing under the Federal WSRA.

Water Quality As Shasta Lake's water levels rise, vegetation and soils along the banks of the affected portion of Segment 4 would become inundated. Most or all of the vegetation that is inundated would eventually die and be washed or fall into the river, bringing with it sediment and other materials that could affect water quality. Soils in the affected portion of Segment 4 would erode as water levels rise and fall, causing an increase in turbidity. These effects would likely be most noticeable during the initial inundation periods, since the river corridor is likely to eventually stabilize as the soil is eroded to bedrock.

Within the approximately 1,470-foot reach of Segment 4 that would be affected under CP1, water temperatures would fluctuate relative to temperatures immediately upstream. Similar to flow, these changes would vary by water year type. Increased turbidity and warmer water temperatures would be most noticeable along the affected portion of Segment 4 because this area has not been previously exposed to periodic inundations.

Adverse effects on water quality would be associated with the periodic fluctuations in the water levels of Shasta Lake. Because water quality is a fundamental requirement for wild and scenic river eligibility, the 1,470-foot reach of Segment 4 that would be affected by CP1 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Under CP1, erosion of rock outcrops and expansion of the bathtub ring in an approximately 1,470-foot reach of Segment 4 could expose buried or previously undiscovered prehistoric cultural resources associated with Wintu occupation of the area and historic recreational uses of the area. As this reach becomes inundated, any exposed resources would be susceptible to the effects of water, which could damage or otherwise alter their values, affecting their eligibility for listing on the National Register of Historic Places and reducing their importance for providing information on past use within the corridor. As the water recedes, exposed resources would be susceptible to wind and rain and could be visible, potentially exposing them to theft or vandalism. These adverse effects would be localized along the corridor of the affected portion of Segment 4 and would likely only affect a small portion of the cultural resources that may be associated with the lower McCloud River basin.

The historic structures associated with the Bollibokka Club occur outside of the area that would be affected by the expanded transition reach and would not be affected. However, unrecorded resources associated with the Wintu village locations may occur within the corridor along the river and could be subjected to periodic inundation, deposition, and scour within the upper portions of the

expanded transition reach. Portions of three other recorded sites could also be subject to similar impacts within the expanded transition reach, which could result in damage to resources within the sites. Although these sites may provide information on the area's history or prehistory, none of these sites has been evaluated for listing on the National Register of Historic Places.

Sacred sites important to Native Americans have not been specifically identified, and access to lands adjacent to the reach that would be periodically inundated under CP1 is limited because all of these lands are privately owned.

The cultural resources located along the 1,470-foot reach of Segment 4 that would be affected under CP1 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the 1,470-foot extension of the transition reach would be affected during periodic inundations, resulting in potential adverse effects on the fish that occur in the river. Potential adverse effects on fish could include a reduction in spawning habitat for trout in the expanded transition reach and an increase in the range of warmwater fish in the lower McCloud River. Fishing opportunities would not be affected more than they are now with the periodic fluctuations in river levels.

Under CP1, the transition reach would be extended by about 1,470 feet to the 1,078-foot elevation, resulting in a larger inundation area when Shasta Lake water levels are the highest. Aquatic habitat in the affected portion of Segment 4 consists primarily of flatwater habitat (52 percent glide, 19 percent mid-channel pool, and 13 percent run), with pocket water (11 percent) and a small, low-gradient riffle (5 percent) in the lower portion of the segment. With the periodic inundations, sediment deposition could cause flatwater habitat to convert to riffle habitat, resulting in a reduction in flatwater habitat of less than 3 percent of the total lower McCloud River's flatwater habitat. During the inundation period, riffle and pool habitat (approximately 1.2 percent of the total lower McCloud River) would be converted to flatwater habitat. Also, riparian vegetation along the newly inundated banks of the affected portion of Segment 4 would be expected to die, which could affect water temperatures and reduce cover for fish in this reach. The extent of these effects would depend on the frequency, duration, and surface elevation of the inundation, which would vary depending on the type of water year and water levels of Shasta Lake.

The migration of fish, especially trout, between the lower McCloud River and Shasta Lake is an important attribute of the unique trout fishery. Many of the rainbow and brown trout that occupy the lower McCloud River spend part of their lives rearing in Shasta Lake, feeding on the abundant prey in the lake and attaining large sizes that would not be possible if they reared only in the river. Upon returning to the river to spawn, these lake-reared fish provide the trophy-sized trout, particularly brown trout, for which the lower McCloud River is renowned (Rode and Dean 2004). Based on a survey that extended up to Tuna

Falls (North State Resources, Inc. 2008), the reach of Segment 4 that would periodically be inundated does not contain any barriers or impediments to fish movement or migration, and CP1 would not create any. Consequently, trout migration through the transition reach to upstream spawning areas would not be impaired.

Conversely, warmwater fish movement between the lake and river is not likely to be facilitated by the expanded transition reach. Warmwater fish from Shasta Lake, such as spotted bass, have been observed throughout the lower McCloud River, at least up to the confluence with Tuna Creek (North State Resources, Inc. 2008). Nonnative warmwater species inhabiting Shasta Lake (e.g., smallmouth bass and spotted bass) are known to exploit riverine and transitional habitats and are effective predators of juvenile trout. No barriers have been observed in the transition reach that could prevent warmwater fish from moving upstream, and no barriers would be created by the expansion of the transition reach. Warmwater fish would continue to be able to move between the lake, the transition reach, and lower McCloud River (Segment 4).

Aquatic habitat changes could affect how fluvial resident trout use habitat within the affected portion of Segment 4. General effects may range from temporary displacement of trout to upstream habitats at high water levels to degraded riverine habitat suitability within the transition reach.

Suitable spawning habitat for rainbow and brown trout in the expanded transition reach is limited because of the few pools and riffles available during the spring and fall when these species spawn. Based on the USFS habitat data and more recent reconnaissance surveys, the amount of spawning gravels in the expanded transition reach represents only a small percentage of the suitable spawning habitat in the lower McCloud River. However, any effect on spawning habitat would be considered adverse.

Geology During periods of maximum inundation in the 1,470-foot portion of Segment 4 that would be affected under CP1, some rock outcrops may become inundated and could erode, but the overall geologic value of the McCloud Limestone features would not be adversely affected.

Visual Quality/Scenery The visual quality of the affected portion of Segment 4 would decrease as the vegetation along the banks becomes inundated and eventually dies, the bathtub ring expands, and evidence of flow is reduced. These conditions would be similar to those in the current transition reach. The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP1 would result in making approximately 1,470 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation

measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP1): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 1,470 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. Although raising Shasta Dam would result in inundation of part of Segment 4, the McCloud River and the adjoining lands in this part of the segment are not National Forest System lands and therefore not subject to the LRMP. Management of the river's ORVs under the STNF LRMP and the CRMP would not be affected. No land use changes would occur along the river, and the USFS and signatories to the CRMP would be able to continue implementing provisions of their plans that apply to the river. Because the LRMP does not apply to the private lands in Segment 4, there would be no impact and no mitigation is required.

Impact WASR-3 (CP1): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The State PRC includes provisions that protect the wild trout fishery of the lower McCloud River. Under CP1, this equates to about 1,470 feet of the river that would be modified and function as an additional portion of the existing transition reach. This reach of the river provides limiting spawning habitat for wild trout (NSR 2009) and during runoff conditions is subject to sedimentation and erosion of the bed and banks similar to upstream reaches. Public access to utilize the fishery offered in this reach is limited to the area below the high-water mark (State Lands) and lands managed by the STNF similar to the other portions of Segment 10 upstream of the McCloud River Bridge. Implementation of proposed modifications to Shasta Dam and Shasta Lake could affect the wild trout fishery (access and ecology) of the lower McCloud River identified in the State PRC. This impact would be potentially significant.

The proposed modifications to Shasta Dam and Shasta Lake would result in periodic fluctuations in water levels within the expanded transition reach, permanently affecting about 1.2 percent of the lower McCloud River and its associated fishery habitat. Under CP1, the transition reach would be extended by about 1,470 feet, a 16 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to that described under Impact WASR-1 and Impact WASR-2 and comparable to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the fishery (populations and habitat) are small in the context of the entire lower McCloud River. This impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP1): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The State PRC includes provisions that protect the free-flowing conditions of the McCloud River, including the conditions in the transition reach upstream of the McCloud River Bridge. Implementation of proposed modifications to Shasta Dam and Shasta Lake could affect the free-flowing conditions of the McCloud River, as identified in the State PRC. This impact would be significant.

The proposed modifications to Shasta Dam and Shasta Lake would result in periodic fluctuations in water levels within the expanded transition reach, permanently affecting about 1.2 percent of the lower McCloud River. Under CP1, the transition reach would be extended by about 1,470 feet, a 16 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the river would not be adversely affected beyond the upstream extension of the transition reach. The primary impact of the expansion of the transition reach would be modifications to the free-flowing character in a manner similar to that described under Impact WASR-1 and Impact WASR-2. While the overall impacts to the free-flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (1.2 percent), this impact would be significant and unavoidable. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

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

CP2 would involve a 12.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 14.5 feet and enlarge the total storage space in the lake by 443,000 acre-feet. This increase would equate to an increase of about 1,850 acres of surface area when the lake is full. CP2 also includes measures to increase water supply reliability while contributing to increased survival of anadromous fish. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 120,000 acre-feet and 60,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP2 would help reduce future water shortages through increasing drought year and average year water supply reliability for agricultural and M&I deliveries. In addition, the increased depth and volume of the cold-water pool in Shasta Reservoir would contribute to improving seasonal water temperatures for anadromous fish in the upper Sacramento River.

Impact WASR-1 (CP2): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Impact WASR-1 (CP2) would be similar to Impact WASR-1 but would affect 1,270 feet more of Segment 4 than CP1.

Implementation of CP2 would reduce the total length of the McCloud River that is eligible for wild and scenic river designation by about 2,740 feet (approximately 2.3 percent of the total length of the lower river). The rest of the lower McCloud River would remain eligible for listing.

Under CP2, approximately 2,740 feet, or 21 percent, of Segment 4 would be periodically inundated. The transition reach would increase to a maximum elevation of 1,084 feet msl, which would extend it by about 2,740 feet (a 30 percent increase over the current transition reach), inundating a larger portion of the lower McCloud River within the study area and Segment 4. The inundated area would increase to approximately 51 total acres (an increase of 18 acres over existing conditions and 9 acres more than CP1 conditions), with a maximum width of approximately 530 feet (an increase of 60 feet over existing conditions) and a total length of approximately 11,740 linear feet (2.22 miles). The extension of the transition reach by approximately 2,740 feet would affect approximately 21 percent of Segment 4. Additional impacts under CP2 compared with CP1 would be minimal and would be limited to the additional 440-foot extension of the transition reach and about 15 additional feet on both sides of the river.

During a wet year, the maximum average water surface elevation of Shasta Lake would be 1,080 feet msl, with a peak elevation of 1,084 feet msl during May. This is an increase of 15 feet above the existing maximum average. During an average water year, the maximum average water surface elevation would increase to 1,051 feet msl, an increase of 11 feet above existing conditions. During dry and critical water years, the change would be on the order of 5 to 9 feet in elevation.

The increased gross pool of Shasta Lake would expand the current transition reach up to the 1,084-foot elevation, a 30 percent increase. Flow conditions and fisheries in the 2,740-foot reach of Segment 4 would periodically be affected, with the timing and duration of the effects similar to those in the current transition reach. Over time, the expansion of the bathtub ring would adversely affect water quality, geology, and visual quality/scenery. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans.

Free-Flowing Conditions As discussed under Impact WASR-1 (CP1), the flow characteristics of the extended transition reach under CP2 would be periodically modified, resulting in slower moving waters and a wider river channel. This modification would not meet the definition of a free-flowing river under the Federal WSRA. The width of the transition reach would be increased by approximately 30 feet on both sides of the river. Flow conditions and the river's free-flowing nature upstream from the expanded transition reach would remain similar to current conditions.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 2,740-foot reach of Segment 4 that would be affected by CP2 would become ineligible for listing under the Federal WSRA.

Water Quality Under CP2, increased turbidity and warmer water temperatures would be most noticeable along the expanded 2,740 feet of the transition reach and in the 30-foot corridor on either side of the transition reach because these areas have not been previously exposed to periodic inundations. As discussed under Impact WASR-1 (CP1), effects on water quality would be associated with the periodic increases in water levels of Shasta Lake.

Because water quality is a fundamental requirement for wild and scenic river eligibility, the 2,740-foot reach of Segment 4 that would be affected by CP2 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Impacts would be the same as discussed under Impact WASR-1 (CP1); however, a slightly larger portion of the three recorded sites and possible resources associated with the known Wintu villages would be inundated.

The cultural resources located along the 2,740-foot reach of Segment 4 that would be affected under CP2 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the affected 2,740-foot segment consists of pocket water and a lateral scour pool. The potential conversion of flatwater habitat to riffle habitat in the 2,740-foot segment would be similar to but greater than under WASR-1 (CP1), and overall impacts to aquatic habitat and fish would be similar to those discussed under Impact WASR-1 (CP1).

Geology Impacts would be the same as discussed under Impact WASR-1 (CP1); the geologic values of the lower McCloud River would not be adversely affected.

Visual Quality/Scenery Impacts would be the same as discussed under Impact WASR-1 (CP1). The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP2 would result in making approximately 2,740 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP2): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 2,740 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. There would be no impact, and no mitigation is required.

Impact WASR-3 (CP2): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-3 (CP1) but the magnitude of the impact would be greater under CP2 because of the longer transition reach. Under CP2, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 2.3 percent of the lower McCloud River. Under CP2, the reach affected by Shasta Lake water levels would be extended by about 2,740 feet, a 30 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. An impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the wild trout fishery, including public access and management opportunities in conjunction with fish habitat and populations, are small in the context of the entire lower McCloud River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP2): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-4 (CP1) but the magnitude of the impact would be greater under CP2 because of the longer transition reach. Under CP2, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 2.3 percent of the lower McCloud River. Under CP2, the reach affected by Shasta Lake water levels would be extended by about 2,740 feet, a 30 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the lower McCloud River would not be adversely affected beyond the upstream extension of the transition reach. While the overall impacts to the free-flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (2.3 percent), the impacts would be significant. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted

by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

CP3, CP4, CP4A, and CP5 – 18.5-Foot Dam Raise, with Variations

CP3, CP4, CP4A, and CP5 would involve an 18.5-foot raise of Shasta Dam, which would increase the lake's gross pool by 20.5 feet and enlarge the total storage space in the lake by 634,000 acre-feet. This increase would equate to an increase of about 2,500 acres of surface area when the lake is full. CP3 focuses on increasing agricultural water supply reliability and increasing anadromous fish survival CP4, CP4A, and CP5 increase water supply reliability and include enhancements in the upper Sacramento River for anadromous fish survival including gravel augmentation and the restoration of riparian, floodplain, and side channel habitat.

CP3 would increase the ability of Shasta Dam to make cold-water releases and regulate water temperatures for fish in the upper Sacramento River, primarily in dry and critical water years. CP3 would help reduce estimated future water shortages by increasing the reliability of dry and critical year water supplies for agricultural deliveries by at least 63,000 acre-feet per year and average annual deliveries by about 62,000 acre-feet per year. Under CP3, operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, with the additional storage retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries.

CP4 would be used to improve the ability to meet temperature objectives and habitat requirements for anadromous fish during drought years and increase water supply reliability. Of the increased reservoir storage space under CP4, about 378,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4, operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as in CP1, with 70,000 acre-feet and 35,000 acre-feet reserved to specifically focus on increasing M&I deliveries during dry and critical years, respectively. CP4 includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River.

CP4A reserves a portion of the increased storage in Shasta Lake for maintaining cold-water volume or augmenting flows in the Sacramento River as part of an adaptive management plan for anadromous fish survival. Of the increased reservoir storage space under CP4A, about 191,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2, with 120,000 acre-feet reserved in dry years and 60,000 acre-feet reserved in critical years for M&I deliveries. CP4A includes augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River. CP5 would help reduce future water shortages through increasing drought year

and average year water supply reliability for agricultural and M&I deliveries. Shasta Dam operational guidelines would continue essentially unchanged, except during dry years and critical years, when 150,000 acre-feet and 75,000 acre-feet, respectively, of the increased storage capacity in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. CP5 also includes constructing additional fish habitat in and along the shoreline of Shasta Lake and along the lower reaches of its tributaries; augmenting spawning gravel and restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake.

Impacts associated with CP3, CP4, CP4A, and CP5 would be very similar to those described for CP1 and CP2, but the increased water levels of Shasta Lake would affect a longer reach of the lower McCloud River. Because of their similarities, and in an effort to reduce redundancy, only the differences between the plans are described below.

Impact WASR-1 (CP3, CP4, CP4A, and CP5): Effect on McCloud River's Eligibility for Listing as a Federal Wild and Scenic River Implementation of CP3, CP4, CP4A, and CP5 would reduce the total length of the McCloud River that is eligible for wild and scenic river designation by about 3,550 feet (less than 3 percent of the total length of the lower river). The rest of the lower McCloud River would remain eligible for listing.

Under CP3, CP4, CP4A, and CP5, the extent of the transition reach would increase to a maximum elevation of 1,090 feet msl, which would extend the current transition reach by about 3,550 feet (a 39 percent increase over the current transition reach), inundating a larger portion of the lower McCloud River within the study area and Segment 4. The inundated area would increase to approximately 60 total acres (an increase of 27 acres over existing conditions, and 9 acres more than CP2 conditions), with a maximum width of approximately 610 feet (an increase of 140 feet over existing conditions) and a total length of approximately 12,550 linear feet (2.38 miles). The extension of the transition reach by approximately 3,550 feet would affect approximately 26 percent of Segment 4. Additional impacts under CP3, CP4, CP4A, and CP5 compared with CP1 and CP2 would be minimal and would be limited to the additional 810-foot extension of the transition reach and about 20 additional feet on either side of the river.

During a wet year, the maximum average water surface elevation of Shasta Lake would be 1,086 feet msl, with a peak elevation of 1,090 feet msl during May. This is an increase of 21 feet above the existing maximum average. During an average water year, the maximum average water surface elevation would increase to 1,054 feet msl, an increase of 14 feet above existing conditions. During dry and critical water years, the change would be on the order of 6 to 13 feet in elevation.

The increased gross pool of Shasta Lake would expand the current transition reach by approximately 3,550 feet (810 feet beyond CP2's effects) up to the 1,090-foot elevation, resulting in a 39 percent increase in the transition reach. Within the expanded transition reach, flow conditions and fisheries would periodically be affected, with the timing and duration of the effects similar to those in the current transition reach. Over time, the expansion of the bathtub ring would affect water quality, geology, and visual quality/scenery. Erosion of soils along the river could expose buried cultural resources, and periodic inundation could permanently alter cultural resource values and features in the transition reach important to Native Americans.

Free-Flowing Conditions As discussed under Impact WASR-1 (CP1), the flow characteristics of the extended transition reach under CP3, CP4, CP4A, and CP5 would be temporarily modified, resulting in slower moving waters and a wider river channel. This modification would not meet the definition of a free-flowing river under the Federal WSRA. The width of the transition reach would be increased by approximately 70 feet on either side of the river. Flow conditions and the river's free-flowing nature upstream from the expanded transition reach would remain similar to current conditions.

Because free-flowing conditions are a fundamental requirement for wild and scenic river eligibility, the 3,550-foot reach of Segment 4 that would be affected by CP3, CP4, CP4A, and CP5 would become ineligible for listing under the Federal WSRA.

Water Quality Under CP3, CP4, CP4A, and CP5, increased turbidity and warmer water temperatures would be most noticeable along the expanded 3,550-foot reach of the transition reach and in the 70-foot corridor on either side of the transition reach because these areas have not been previously exposed to periodic inundations. Under these plans, the wider affected river corridor could result in greater temporary effects on water quality because more vegetation would be temporarily inundated and more soils would be exposed. As discussed under Impact WASR-1 (CP1), effects on water quality would be associated with the periodic increases in water levels of Shasta Lake.

Because water quality is a fundamental requirement for wild and scenic river eligibility, the 3,550-foot reach of Segment 4 that would be affected by CP3, CP4, CP4A, and CP5 would become ineligible for listing under the Federal WSRA.

Outstandingly Remarkable Values As described above under Affected Environment, the ORVs that make Segment 4 of the McCloud River eligible for listing as a wild and scenic river are cultural/historical resources, fisheries, geology, and visual quality/scenery.

Cultural/Historical Resources Impacts would be similar to those discussed under Impact WASR-1 (CP1). Under CP3, CP4, CP4A, and CP5, the

wider affected river corridor could result in greater effects on cultural resources because of the wider inundated area and increased erosion. Larger portions of the three recorded sites and known Wintu villages would become inundated.

The cultural resources located along the 3,550-foot reach of Segment 4 that would be affected under CP3, CP4, CP4A, and CP5 would be subject to the effects of periodic inundation.

Fisheries Aquatic habitat in the additional 810-foot segment under CP3, CP4, CP4A, and CP5 consists of a mid-channel pool and a lateral scour pool. The potential conversion of flatwater habitat to riffle habitat in the 3,550-foot reach of Segment 4 that would be affected under these plans would be similar to but greater than under WASR-1 (CP1), and overall impacts to aquatic habitat and fish would be similar to those discussed under Impact WASR-1 (CP1).

Geology Impacts would be the same as discussed under Impact WASR-1 (CP1), except additional rock outcrops could become inundated because of the wider affected corridor.

Visual Quality/Scenery Impacts would be similar to those discussed under Impact WASR-1 (CP1). Under these plans, the wider affected river corridor could result in greater effects on the visual setting because of the wider inundated area and increased impacts on vegetation. The water line would also be visible at a higher elevation and could be more noticeable. The affected portion of Segment 4 would no longer have the qualities that contributed to its classification by the USFS as “scenic.”

CP3, CP4, CP4A, and CP5 would result in making approximately 3,550 feet of the lower McCloud River ineligible for listing as wild and scenic. This impact would be significant. Mitigation for this impact is not currently available. If authorized, additional studies will be conducted by Reclamation to determine if feasible mitigation measures could be developed. Since no mitigation is currently available, this impact would be significant and unavoidable.

Impact WASR-2 (CP3, CP4, CP4A, and CP5): Conflict with Shasta-Trinity National Forest Land and Resource Management Plan The inundation of approximately 3,550 feet of Segment 4 would not conflict with the provisions in the STNF LRMP to protect the ORVs that make the McCloud River eligible for listing under the Federal WSRA. There would be no impact, and no mitigation is required.

Impact WASR-3 (CP3, CP4, CP4A, and CP5): Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-3 (CP1), but the magnitude of the impact would be greater under CP3, CP4, CP4A, and CP5 because of the longer transition reach. Under CP3, CP4, CP4A, and CP5, the proposed modifications to Shasta Dam and Shasta Lake would result in

temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 3 percent of the lower McCloud River. Under CP3, CP4, CP4A, and CP5, the reach affected by Shasta Lake water levels would be extended by about 3,550 feet, a 39 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the wild trout fishery including public access and management opportunities in conjunction with fish habitat and populations are small in the context of the entire lower McCloud River, this impact would be potentially significant. Mitigation for this impact is proposed in Section 25.4.4.

Impact WASR-4 (CP3, CP4, CP4A, and CP5): Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542 The impact would be similar to WASR-4 (CP1), but the magnitude of the impact would be greater under CP3, CP4, CP4A, and CP5 because of the longer transition reach. Under CP3, CP4, CP4A, and CP5, the proposed modifications to Shasta Dam and Shasta Lake would result in temporary and periodic fluctuations in water levels within the expanded transition reach, affecting about 3 percent of the lower McCloud River. Under CP3, CP4, CP4A, and CP5, the reach affected by Shasta Lake water levels would be extended by about 3,550 feet, a 39 percent increase over the current transition reach; this entire area would be inundated only during peak water levels in the spring of wet years. The free-flowing conditions of the river would not be adversely affected beyond the upstream extension of the transition reach. The primary impact of the expansion of the transition reach would be conversion of aquatic habitat in a manner similar to the habitat conversion that can be observed in the current transition reach downstream. While the overall impacts to the free flowing conditions that would occur within this transition reach are small in the context of the lower McCloud River (3 percent), the impacts would conflict with the State PRC. This impact would be significant. Mitigation for this impact is proposed in Section 25.4.4. If authorized, additional studies will be conducted by Reclamation to refine this mitigation measure. Although mitigation has been identified, this impact would be significant and unavoidable.

25.4.4 Mitigation Measures

Table 25-2 presents a summary of mitigation measures for wild and scenic rivers.

The mitigation measures described in the following section were developed partly in response to comments on the DEIS. While these measures are considered to be potentially feasible and effective in their ability to reduce impacts, this EIS acknowledges that there is uncertainty with respect to reducing impacts to less-than-significant levels.

Table 25-2. Summary of Mitigation Measures for Wild and Scenic Rivers

Impact		No-Action Alternative	CP1	CP2	CP3	CP4/ CP4A	CP5
Impact WASR-1: McCloud River's Eligibility for Listing as a Federal Wild and Scenic River	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	No feasible mitigation available to reduce impact at this point in the planning process.				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU
Impact WASR-2: Conflict with Shasta-Trinity National Forest, Land and Resource Management Plan	LOS before Mitigation	NI	NI	NI	NI	NI	NI
	Mitigation Measure	None required.	None required.				
	LOS after Mitigation	NI	NI	NI	NI	NI	NI
Impact WASR-3: Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542	LOS before Mitigation	NI	PS	PS	PS	PS	PS
	Mitigation Measure	None required.	WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Fishery Protection, Restoration and Improvement Program for the Lower McCloud River Watershed.				
	LOS after Mitigation	NI	PS	PS	PS	PS	PS
Impact WASR-4: Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542	LOS before Mitigation	NI	S	S	S	S	S
	Mitigation Measure	None required.	Mitigation Measure WASR-4 (CP1-CP5): Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed				
	LOS after Mitigation	NI	SU	SU	SU	SU	SU

Key:
CP = Comprehensive Plan
LOS = level of significance
NI = no impact
PS = potentially significant
S = significant
SU = significant and unavoidable

No-Action Alternative

Under the No-Action Alternative, no action would be taken, including implementation of mitigation measures; rather, existing conditions would continue to change in response to natural processes and human activities. No mitigation measures are required for the No-Action Alternative.

Mitigation Measure WASR-3 (CP1-CP5): Develop and Implement a Comprehensive Multi-scale Wild Trout Fishery Protection, Restoration and Improvement Program Within the Lower McCloud River Watershed

The inundation of a portion of the lower McCloud River will affect the habitat available to wild trout and other aquatic organisms. The impacts are similar to, but more specific to the lower McCloud River watershed than those described under Impact Geo-2 in Chapter 4, "Geology, Geomorphology, Minerals and Soils"; Impact WQ-1 in Chapter 7, "Water Quality"; and Impacts Aqua-4 and Aqua-7 in Chapter 11, "Fisheries and Aquatic Ecosystems." This mitigation measure incorporates Mitigation Measures Geo-2, WQ-1, and Aqua-4.

This mitigation measure also includes the commitment to identify suitable sections of the lower McCloud River protected under the State PRC that may be available for acquisition from willing sellers for purposes of protecting, restoring and improving the wild trout fishery. This element of the mitigation measures is intended to be consistent with CDFW's wild trout policy as defined in the Strategic Plan for Trout Management, Appendix E, Section C (CDFG 2003), emphasizing designation and management of the wild trout fishery available to the public.

Watershed analysis and assessments prepared for the lower McCloud River watershed document that roads and modified fire regimes have increased sediment contributions to receiving waters, particularly in those watersheds that have been subjected to mining, forest management, and other types of large-scale developments and disturbances (CVWRCB 2011). Reclamation will apply this element of this mitigation measure to protect, restore, and improve the wild trout fishery in the lower McCloud River watershed.

The STNF, through the efforts of the interagency mitigation working group described in Chapter 2, "Action Alternatives," identified that acquisition of lands along the lower McCloud River is a priority and is consistent with the LRMP to meet a number of resource goals and objectives (e.g., cultural resources, recreation, biological resources). Under Impacts WASR-3 and WASR-4, the wild trout fishery and free-flowing conditions in the main stem lower McCloud River that would be affected in the protected reach would be at most 3,550 feet. This element of Mitigation Measure WASR-3 would include acquisition of private lands along the river corridor commensurate with the selected action alternative, if authorized, and available from a willing seller.

This mitigation measure requires that Reclamation work with the watershed stakeholders (e.g., CRMP members) to develop a basin plan that identifies deficient areas where riparian and watershed improvements can be made and work with landowners to improve those areas. Reclamation will commit to funding the planning effort, which will be completed within 10 years after construction has been initiated. This plan is intended to reduce the impacts of inundation on the wild trout fishery in the McCloud River and its tributaries. This program would be performed in conjunction with the efforts of the interagency work group described in Mitigation Measure Geo-2.

Although implementation of this mitigation measure will reduce the impacts associated with WASR-3, Reclamation acknowledges that the impact would remain potentially significant.

Mitigation Measure WASR-4 (CP1-CP5): Implement Protection, Restoration, and Improvement Measures to Benefit Hydrologic Functions Within the Lower McCloud River Watershed The inundation of a portion of the lower McCloud River will impede the free-flowing nature of as much as 3,550 feet of the river, thereby affecting the hydrologic and hydraulic

characteristics of the affected reach. These impacts are similar to other inundated tributaries, but more specific to the lower McCloud River. These impacts are described in Chapter 4, "Geology, Geomorphology, Minerals and Soils" (Impact Geo-2); Chapter 7, "Water Quality" (Impact WQ-1); and Chapter 11, "Fisheries and Aquatic Ecosystems" (Impacts Aqua-4 and Aqua-7). This mitigation measure incorporates Mitigation Measures Geo-2, WQ-1, and Aqua-4, specifically in the context of increasing the overall hydrologic function of the lower McCloud River watershed in a variety of ways. Examples of the measures that may be implemented include the following:

- Silviculture treatments that improve fuel conditions, reduce runoff from high intensity fires and enhance the functions and values of wetlands and riparian areas

- Road decommissioning and drainage improvement projects that reduce concentrated road-related runoff and reestablish flows to tributaries to the lower McCloud River

- Restoration/improvement of in-channel habitat to enhance potential for sustained flows from tributaries

This measure also includes the mitigation measures described in Chapter 12, "Botanical Resources and Wetlands," intended to support land acquisition and wetland mitigation. Five mitigation measures would be applicable to WASR-4: Bot-2, Bot-3, Bot-4, Bot-5 and Bot-7. Land acquisition and wetland mitigation measures are intended to offer a certain level of protection from future development (e.g., diversions) as well as opportunities to improve the hydrologic function at multiple scales that could provide an overall benefit to the free-flowing conditions of the lower McCloud River.

Although implementation of this mitigation measure will reduce the impacts associated with WASR-4, Reclamation acknowledges that the impact would remain significant and unavoidable.

25.4.5 Topics Eliminated from Further Consideration

No topics related to the eligibility of the McCloud River for listing under the Federal WSRA, the compatibility of the alternatives with the STNF LRMP or the CRMP, or their compatibility with the PRC providing protection to the McCloud River were eliminated from further consideration.

25.4.6 Cumulative Effects

Chapter 3, "Considerations for Describing the Affected Environment and Environmental Consequences," gives an overview of the cumulative effects analysis, including significance criteria, and discusses the relationship of this analysis to the CALFED Programmatic Cumulative Impacts Analysis. Table 3-1, "Present and Reasonably Foreseeable Future Actions Included in the Analysis of Cumulative Impacts, by Resource Area," in Chapter 3, lists the

projects considered quantitatively and qualitatively within the cumulative impacts analysis. This cumulative impacts analysis accounts for potential project impacts combined with the impacts of existing facilities, conditions, land uses, and reasonably foreseeable actions expected to occur in the study area on a qualitative and quantitative level. None of the projects listed in Table 3-1 under Quantitative Analysis would have impacts on the McCloud River in the primary study area and the SLWRI would not have adverse impacts in the extended study area; therefore, the following analysis is based on programs and projects listed in Table 3-1 under Qualitative Analysis that would have potential effects in the primary study area as explained below.

Significant effects were identified related to the compatibility of the project with the PRC, Section 5093.542. The potential effects would be of greater magnitude and duration with the larger dam raises (i.e., CP3 through CP5 would have greater potential effects than CP1 and CP2). These impacts may also be associated with two reasonably foreseeable future actions that could affect the McCloud River: the relicensing of PG&E's McCloud-Pit Project and the pilot project to reintroduce anadromous salmonid populations upstream from Shasta Dam. FERC has issued the Final EIS for the relicensing of the McCloud-Pit Project. However, the relicensing process for the McCloud-Pit Project is ongoing, and the conditions that may be required under a new FERC license are uncertain. The potential effects of the relicensing on the lower McCloud River are therefore unknown.

In 2012, the Bagley Fire and subsequent winter flood events resulted in significant changes to vegetation conditions, erosional processes, and water quality in the lower McCloud River watershed. The impacts of this combination of natural disturbances are ongoing and there is considerable uncertainty on how they are affecting the physical processes and biological resources of the lower McCloud River watershed. Subsequent management activities (e.g., road reconstruction, silviculture) are ongoing throughout the Bagley Fire area.

The 2009 NMFS Biological Opinion described in Chapter 3 requires Reclamation to implement a pilot project that would provide passage for anadromous salmonids upstream from Shasta Dam. This project is listed in Table 3-1 as the Fish Passage Program at Shasta. This project could reintroduce anadromous salmonids to the lower McCloud River. At this point in the planning process, the details of this project are ill-defined and the potential for success is uncertain. Therefore, the potential effects of this future action on the lower McCloud River are unknown. Given the information available on these future actions, the potential for project-related impacts to be cumulatively considerable would be less than significant and could, in fact, result in benefits to some of the values and resources of the lower McCloud River.

EXHIBIT D

JAN 14 2019

Mr. Jose Gutierrez
Westlands Water District
3130 N. Fresno Street
P.O. Box 6056
Fresno, CA 93703-6056

Shasta Dam Raise Project
c/o: Stantec
3301 C Street, Suite 1900
Sacramento, CA 95816

COMMENTS ON WESTLANDS WATER DISTRICT'S INITIAL STUDY/NOTICE OF PREPARATION FOR THE SHASTA DAM RAISE PROJECT; SHASTA COUNTY

Dear Mr. Gutierrez:

This letter provides State Water Resources Control Board (State Water Board) comments in response to Westlands Water District's (WWD) November 30, 2018 Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) for the Shasta Dam Raise Project (Project). The State Water Board understands WWD held a public scoping meeting for the Project on December 12, 2018 in Redding, California, and is requesting comments by January 14, 2019. The State Water Board appreciates the opportunity to comment on the NOP and provide input on the proposed Project and alternatives.

The NOP contemplates a "range" of six action alternatives that primarily consist of raising the crest height of Shasta Dam between 6.5 and 18.5 feet. The increased height and ancillary features would be expected to increase storage capacity at Shasta Reservoir between 256,000 acre-feet to 634,000 acre-feet, depending on the selected alternative. Construction of any of the alternatives would require modifications to existing dam infrastructure, including spillway gates, outlet works, penstocks, and the water temperature control device. Additionally, the alternatives would require intensive construction activities not directly associated with dam operation, including relocation or modification of recreation facilities, wastewater treatment facilities, bridges, roads, and railroads.

California Wild and Scenic Rivers Act

The California Wild and Scenic Rivers Act (Pub. Res. Code, § 5093.50 et seq.) includes a section specifically applicable to the McCloud River. Subdivision (c) of section 5093.542 of the Public Resources Code provides:

> Except for participation by the Department of Water Resources in studies involving the technical and economic feasibility of enlargement of Shasta Dam, no department or agency of the state shall assist or cooperate with, whether by loan, grant, license, or otherwise, any agency of the federal, state, or local government in the planning or construction of any dam, reservoir, diversion, or other water impoundment facility that

> could have an adverse effect on the free-flowing condition of the McCloud River, or on its wild trout fishery.

WWD is an agency of the state. (Wat. Code, §§ 37822, 37823.) Acting as lead agency under the California Environmental Quality Act (CEQA) for this Project involves the assistance or cooperation with the planning or construction of water impoundment facilities. Cost sharing in the Project, including cost sharing in the preparation of the environmental documentation under CEQA needed for state or local approvals, likewise would involve assistance or cooperation in the planning or construction of the facilities. If those facilities could adversely affect the free-flowing character of the McCloud River, WWD's participation is prohibited. A similar issue arises concerning the effect of the action alternatives on the McCloud River wild trout fishery.

All alternatives identified in the NOP, except for the No Project Alternative, would increase the storage capacity of Shasta Reservoir. When additional water is impounded using that increased storage capacity, the areas affected will include the reach of the McCloud River protected under section 5093.542 of the Public Resources Code, converting the affected area from a free-flowing stretch of river to impounded waters. The action alternatives "could have an adverse effect on the free-flowing condition of the McCloud River" within the meaning of section 5093.542 of the Public Resources Code.

The NOP lists the impact on McCloud River free-flowing conditions as "TBD." (NOP, p. 2-32). It does not appear, however, that postponing a finding on this impact makes the statutory prohibition inapplicable. Section 5093.542 prohibits assistance in the "planning" of facilities that "could have an adverse effect."

In addition to prohibiting cooperation in the planning of a project that could adversely affect the free-flowing condition of the McCloud River, section 5093.542 of the Public Resources Code prohibits assistance or cooperation by "license, or otherwise." This language bars the State Water Board and other agencies of the state from issuing any permit or other approval for a project that could adversely affect the free-flowing character of the McCloud River or its wild trout fishery. Necessary permit approvals for the State Water Board includes approvals under sections 401 and 402 of the Clean Water Act and time extensions for U.S. Bureau of Reclamation's (Reclamation) water right permits, as discussed below.

If WWD has evidence indicating that the proposed Project can be constructed and operated without adverse effects on the free-flowing character of the McCloud River or on its wild trout fishery, the State Water Board would be happy to review it. Unless and until the issue is resolved, however, it would be inappropriate for WWD to proceed with preparation of the DEIR.

Water Right Time Extensions

If the proposed Project could proceed in compliance with the Wild and Scenic Rivers Act, the proposed Project would require time extensions for several water right permits. Water diversion and storage at Shasta Dam is regulated by the State Water Board pursuant to Reclamation water right Permits 12720, 12721, 12722, 12723, and 12724 (Applications 5625, 5626, 9363, 9364, and 9365, respectively). Reclamation's water right permits include a deadline to complete construction work by December 1, 1985, and a deadline to complete application of the water to beneficial use by December 1, 1990. Construction activities involving expanding the capacity of Shasta Reservoir, which would allow for increase in beneficial use under the permits, cannot commence unless and until the State Water Board approves extensions of time for Reclamation's water rights. (Wat. Code, §§ 1397, 1398.) Reclamation previously filed petitions with the State Water Board requesting extensions of time until December 2030 to complete

construction and use pursuant to the water right permits. The petitions have been publicly noticed and numerous protests of the proposed time extensions remain active. CEQA compliance is also necessary before the State Water Board can approve the time extensions.

Water Quality Approvals

In addition to the time extensions, the proposed Project and alternatives would impact Waters of the United States and most likely require a Clean Water Act section 404 Dredge and Fill Permit from the United States Army Corp of Engineers. In addition, Section 401 of the Clean Water Act (33 U.S.C. § 1341) requires every applicant for a federal license or permit which may result in a discharge into navigable waters to provide the licensing or permitting federal agency with certification that the project will be in compliance with specified provisions of the Clean Water Act, including water quality standards and implementation plans promulgated pursuant to section 303 of the Clean Water Act (33 U.S.C. § 1313).

Clean Water Act section 401 directs the agency responsible for water quality certification (certification) to prescribe effluent limitations and other limitations necessary to ensure compliance with the Clean Water Act and with any other appropriate requirements of state law. In this instance, the State Water Board is the state agency responsible for certification. (Wat. Code, § 13160; see Cal. Code Regs. tit. 23, § 3855, subd. (b)(1)(B).) In taking a certification action, the State Water Board must either: 1) issue an appropriately conditioned certification; or 2) deny the certification request. (Cal. Code Regs., tit. 23, § 3859.)

In addition, the Project would need a National Pollutant Discharge Elimination System (NPDES) permit under Clean Water Act section 402 for storm water discharges from construction activities. In California, the NPDES program is administered by the State Water Board and Regional Water Quality Control Boards (Regional Water Boards). (Wat. Code, § 13370 et seq.) To authorize storm water discharges from construction activity, a project proponent must apply for coverage under the Construction General Permit or apply for a separate NPDES permit.

Update of the Bay-Delta Plan

The State Water Board is in the process of updating the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) to protect beneficial uses in the Bay-Delta watershed. The Sacramento/Delta update to the Bay-Delta Plan is focused on the Sacramento River and its tributaries, Delta eastside tributaries, Delta outflows, and interior Delta flows. On July 6, 2018, the State Water Board released a Framework providing additional detail about potential updates to flow requirements for the Sacramento River, its tributaries, and the Delta and its tributaries (Framework). The Framework describes proposed amendments to the Bay-Delta Plan that will be evaluated in an upcoming draft Staff Report. The proposed amendments include new inflow objectives, a new cold water habitat objective, modified Delta outflow objectives, and modified interior Delta flow objectives. All water users throughout the Sacramento/Delta watershed, including diverters upstream of dams and in the Delta, would be subject to the proposed inflow, cold water habitat, and Delta outflow requirements for the Sacramento/Delta watershed (with the exception of *de minimis* diversions). Accordingly, any EIR prepared for the Project should evaluate flow regimes consistent with potential updates to the Bay-Delta Plan, including a flow regime within the range of 45 to 65 percent of unimpaired flow below Shasta Dam that is consistent with the implementation provisions described in the Framework, as well as other provisions consistent with the proposed cold water habitat, Delta outflow, and interior Delta flow objectives.

Water Quality Issues

A number of different water quality impacts would also be expected to occur due to sediment discharges into Lake Shasta from increased shoreline erosion. Mercury, copper, zinc, and other pollutants associated with sediment would increase and impact already elevated concentrations in Lake Shasta, Keswick Reservoir, and the downstream Sacramento River. Elevated metals concentrations would adversely affect aquatic life, adversely affect source water filtration ability for drinking water treatment plants, and limit regulatory compliance options at downstream wastewater treatment plants. Changes in flow regimes would impact dilution of legacy mining discharges and increase hydromodification in the lower reaches of tributary watersheds. These preceding impacts could be significant, although partial mitigations could likely be devised. Additional water quality concerns are identified in a September 11, 2013 letter the Central Valley Regional Water Quality Control Board (Central Valley Regional Water Board) submitted to Reclamation, and is enclosed for your reference.

If you have any questions regarding this letter or the enclosure, please contact Mr. Erik Ekdahl, Deputy Director of the Division of Water Rights at the State Water Board, by email at erik.ekdahl@waterboards.ca.gov or by phone at (916) 341-5316, or Mr. Clint Snyder, Assistant Executive Officer at the Central Valley Regional Water Board, by email at clint.snyder@waterboards.ca.gov or by phone at (530) 224-3213.

Sincerely,

ORIGINAL SIGNED BY

Eileen Sobeck
Executive Director

Enclosure: September 11, 2013 Letter from Pamela C. Creedon of the Central Valley Regional Water Quality Control Board to Katrina Chow of the Bureau of Reclamation: *Comments on the Shasta Lake Water Resources Investigation Draft Environmental Impact Statement, Shasta County*

cc: Mr. Patrick Pulupa, Executive Officer
Central Valley Regional Water
Quality Control Board
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Rancho Cordova, CA 95670-6114

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EXHIBIT E

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Northern Region
601 Locust Street
Redding, CA 96001
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

January 14, 2019

Jose Gutierrez
Westlands Water District
3130 N. Fresno Street
Fresno, CA 93703

Subject: Review of the Initial Study and Notice of Preparation for the Shasta Dam Raise Project, State Clearinghouse Number 2018111058, Shasta and Tehama Counties

Dear Mr. Gutierrez:

The California Department of Fish and Wildlife (Department) has reviewed the Initial Study and Notice of Preparation (NOP) dated November 2018, for the above-referenced project (Project). As a trustee for the State's fish and wildlife resources, the Department has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants and their habitat. The Department offers the following comments and recommendations on this Project in our role as a trustee agency pursuant to the California Environmental Quality Act (CEQA; California Public Resources Code [PRC] section 21000 *et seq.*).

Project Description

The Project as proposed includes raising the Shasta Dam up to 18.5 feet and increasing the storage capacity in Shasta Reservoir up to 634,000 acre-feet. Project features and related construction activities include the following: clearing vegetation from portions of the inundated reservoir area; constructing the dam, appurtenant structures, reservoir area dikes, and railroad embankments; and relocating roadways, bridges, recreation facilities, utilities, and miscellaneous minor infrastructure. The Primary Study Area includes Shasta Dam and Lake; the lower portions of all contributing major and minor tributaries flowing into Shasta Lake; Trinity and Lewiston reservoirs; the Sacramento River and between Shasta Dam and the Red Bluff Pumping Plant (RBPP), including tributaries at their confluence.

The U.S. Bureau of Reclamation (Reclamation) released the Shasta Lake Water Resources Investigation Final Environmental Impact Statement (SLWRI FEIS) in 2014 and the SLWRI Final Feasibility Report in 2015, evaluating substantially the same project.

The Department has commented on previous iterations of this Project via several letters to Reclamation as required as the State's trustee for natural resources and consistent with the Public Resources Code section 5093.542.

January 31, 2007	Subject: Comments on Request for Review and Comment of the Draft Plan Formulation Report
November 7, 2008	Subject: Comments on the Administrative Draft of the Environmental Impact Statement and Environmental Impact Report, Feasibility Report, and Appendices
January 21, 2010	Subject: Comments on Request for Review and Comment of the Draft Interim Report, December 2009
August 16, 2010	Subject: Comments on Request for Review and Comment of the Reservoir Tributary Fishery Characterization Draft Work Plan, July 2010
April 12, 2011	Subject: Comments on the Second Administrative Draft of the Environmental Impact Statement, Feasibility Report and Fisheries and Geology Appendices for the Shasta Lake Water Resources Investigation.
September 9, 2011	Subject: Comments on Request for Review and Comment of the Reservoir Tributary Fishery Characterization Second Draft Work Plan, July 2011
February 8, 2013	Subject: Comments on the Public Draft of the Feasibility Report and Selected Attachments for the Shasta Lake Water Resources Investigation
April 8, 2013	Subject: Comments on the 2013 Administrative Draft of the Environmental Impact Statement and selected Technical Reports
September 30, 2013	Subject: Comments of the Draft Environmental Impact Statement and Proposed Shasta Dam Enlargement Project/Shasta Lake Water Resources Investigation

Many of the comments and issues made in these letters are still relevant, and should be reviewed as part of the Draft Environmental Impact Report (DEIR) development.

Comments and Recommendations

CEQA Guidelines 15063(d)(3) requires that identified environmental effects listed in the initial study are to be briefly explained to indicate that there is some evidence to support the checklist entries. The brief explanation may be through narrative or a reference to an earlier Environmental Impact Report (EIR). If reference to an earlier EIR is used, a citation to the page or pages where the information is found should be included. However, an initial study is neither

intended nor required to include the level of detail included in an EIR. (CEQA Guidelines, section 15063, subd. (a)(3)). Here, Westlands Water District as the Lead Agency, cited to the 2014 SLWRI FEIS. Westlands refers the NOP reader to entire sections within the SLWRI FEIS, some of which are hundreds of pages. Although this approach may provide evidence in support of the checklist entries, it does not "briefly" explain the evidence and is burdensome. The Department is unable to fully evaluate the NOP and review numerous sections of the SLWRI FEIS to provide a complete and detailed response during the 45-day review period. Therefore, while the Department is providing this letter in response to the NOP, the Department may continue to identify potentially significant impacts of this Project of Statewide importance as the CEQA process unfolds.

Project Alternatives

CEQA Guidelines section 15126.6(e)(1) and (2) state a "No Project" alternative shall be evaluated and "shall discuss the existing conditions at the time the notice of preparation is published." Only Comprehensive Plans (CP) 1 through 5 are presented in the NOP, none of which is a No Project alternative. The Department recommends evaluating the No Project alternative in the draft EIR.

Further, the NOP must identify the existing environmental conditions (see CEQA Guidelines, § 15063, subd. (d)(2).) Instead, the NOP relies solely on the 2014 SLWRI FEIS for its environmental analysis, and that SLWRI FEIS in turn reaches conclusions based predominately on baseline conditions from 2013 and earlier with the most recent update (2014) occurring for botanical surveys. Studies Reclamation conducted are well over five years old and need to be updated to present a meaningful basis for analysis, particularly given changed regulatory circumstances and operational rules, historic drought, and large wildfires that have affected the Project area since 2005. The Department recommends all biological surveys over 5 years old be updated and field verified prior to the release of the draft EIR in order to reflect an accurate biological baseline.

Biological Resources

Thousands of acres of terrestrial and potentially hundreds of acres of riverine and aquatic habitat would be impacted under the six alternatives that were presented in the NOP. This amount of impacted public trust resources (fish, wildlife, native plants, and natural communities) is a substantial loss. All of the dam raise alternatives would result in significant and unavoidable impacts to a large number of terrestrial and aquatic resources. Asserted benefits to fish should not be looked at as a means to offset, mitigate, or account for impacts to wildlife, botanical, and other resource values, including habitats.

A primary objective of the Project is to increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the Red Bluff Pumping Plant. The other primary objective is to "Increase water supply and water supply reliability for agricultural, M&I [Municipalities & Industrial], and environmental purposes to help meet current and future water demands." It is unclear to the Department whether the Project is capable of substantially benefitting anadromous fish, particularly in a manner that provides equal weight to the other primary objective of water supply and water supply reliability. The SLWRI FEIS demonstrated that benefits to anadromous fish appear to be further limited whenever operation to benefit anadromous fish are in conflict with current operational guidelines or water supply reliability. For example, page 1-12 of the NOP discusses a cold water pool adaptive management plan that "may include operational changes...to benefit anadromous fish." Page 2-61 of the SLWRI FEIS discusses the adaptive management benefitting anadromous fish as follows (emphasis added): "The adaptive management plan may include operational changes to the timing and magnitude of releases from Shasta Dam to benefit anadromous fish, ***as long as there were no conflicts with current operational guidelines or adverse impacts on water supply reliability***."

Many other projects could increase survival and recovery of anadromous fish. The NOP relies on increasing the volume of the cold-water pool as the primary means to increase anadromous fish survival in the Sacramento River. However, the Department believes increasing the cold-water pool via a dam enlargement is not the top anadromous fish recovery priority. A range of other higher priority recovery actions are identified in various recovery plans, five-year reviews, and recovery strategies for Central Valley anadromous fish. For example, improving flow management; screening pumps and diversions; enhancement of spawning and rearing habitat; removing fish passage barriers, and floodplain restoration could also achieve increased anadromous fish survival, and would do so in a much more efficient and cost effective manner than raising Shasta Dam. The SLWRI FEIS eliminated consideration of lower cost and lower impact alternatives, and limited the range of alternatives to those that would raise Shasta Dam. The NOP's Project objectives should accommodate a range of alternatives that would increase survival and recovery of anadromous fish and improve water supply reliability without raising Shasta Dam.

Fisheries Resources and Water Operations

The preliminary determinations of significant impacts in the NOP for downstream impacts to aquatic biological resources (Impact Aqua-9 through 24) are taken from the 2014 SLWRI FEIS. These 2014 conclusions are predicated on baseline conditions from 2005 and future conditions at 2030. CEQA Guidelines section 15125 requires an EIR to describe the environmental conditions in the vicinity of the project at the time of NOP publication, which would then serve as the baseline

for evaluation of impacts. Several regulatory documents affecting Sacramento River operations have been developed since 2005, including U.S. Fish and Wildlife Service (FWS) 2008 Biological Opinion (BiOp) for Delta smelt and the National Marine Fisheries Service (NMFS) 2009 *Biological Opinion and Conference Opinion on the Long-term Operations of the Central Valley Project and the State Water Project*, and the CDFW 2009 Incidental Take Permit for ongoing operations of the State Water Project in the Delta. The Lead Agency's preliminary determinations may be inaccurate since the baseline should consider conditions in 2018 rather than 2005, and incorporate the aforementioned regulatory documents as applicable.

Further, Reclamation has reinitiated Section 7 consultation with NMFS and FWS pursuant to the federal Endangered Species Act. Federal documents indicate that new Biological Opinions could be issued as soon as June 2019. The operational changes that might result from the reinitiated consultation are unknown at this time, and the Department is concerned that there is a disjunction between various processes addressing facility operations that could preclude informed decision-making and public understanding.

For modeling, the 2014 SLWRI FEIS limited its analysis to:

- CalSim-II (primary and extended study areas). This modeling does not incorporate real-time operations decision-making;
- Sacramento River Temperature Model;
- SALMOD, VERSION 3.8 (Primary study area) for Impact Aqua-12, Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operation – Chinook Salmon and Steelhead, which considers the Sacramento River only from Keswick to the Red Bluff Pumping Plant; and
- A qualitative assessment of aquatic impacts primarily based on changes to monthly average flows with a threshold of >5% change constituting a significant impact or benefit.

The Department considers this analysis to be insufficient in describing the full potential of downstream impacts that could result from the proposed Project. The analysis relies on a single quasi-life cycle model that considers egg-to-juvenile life stages only, and does not consider year- over-year impacts, supplemented with a qualitative analysis. In particular, while there may be potential to increase reservoir storage that may be beneficial in critical and dry year types, this comes at the expense of reduced flows below Shasta/Keswick during normal, above normal, and wet years. These wetter year types are essential for providing conditions that enhance resilience and recovery of all fish species, particularly listed species and species of special concern that are severely impacted during critical and dry years and extended periods of drought.

The Department recommends that the draft EIR include a comprehensive description of current and proposed Project operations and a comprehensive list of CalSim II modeling inputs and assumptions and a thorough description of climate change scenario inputs to CalSim II. The Department recommends that the applicant tier analyses of biotic and abiotic impacts based on the CalSim II modeling requested above. Biotic and abiotic analyses should utilize the most recently available analyses. These include but may not be limited to, the analyses and methods utilized for the California WaterFix Final EIR/EIS Alternative 4A, the California Water Fix 2081(b) Application[1] [which in turn refers to the California Water Fix Biological Assessment Appendices 5A, 5C, 5D, 5F, 6A, and 6B), the California WaterFix 2081b Permit,[2] the June 16, 2017 National Marine Fisheries Service California WaterFix Section 7 Biological Opinion,[3] and the June 23, 2017 U.S. Fish and Wildlife Service California WaterFix Section 7 Biological Opinion.[4] These analyses and methods are not as limited as the modeling found in the 2014 SLWRI FEIS.

The most pertinent analyses relating to the potential effects of the Project on downstream aquatic resources include, but are not limited to:

Winter-run Chinook Salmon, Spring-run Chinook Salmon, Delta Smelt, Longfin Smelt

- Channel Velocity (DSM2-HYDRO)
- Entry into Interior Delta
- Flow Routing into Channel Junctions

Winter-run Chinook Salmon and Spring-run Chinook Salmon:

- Through-Delta Survival
    - Delta Passage Model
    - Newman 2003 (spring-run only)[5]
    - Perry 2010[6]
    - Perry Survival Model 2017[7]

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[1] Available at https://live-california-waterfix.pantheonsite.io/wp-content/uploads/2017/10/CWF_2081b_10716.pdf
[2] Available at https://live-california-waterfix.pantheonsite.io/wp-content/uploads/2017/10/CWF_website_2081b_072817.pdf
[3] Available at https://www.westcoast.fisheries.noaa.gov/central_valley/CAWaterFix.html
[4] Available at https://www.fws.gov/sfbaydelta/HabitatConservation/CalWaterFix/Index.htm
[5] Newman, K. B. Modelling paired release-recovery data in the presence of survival and capture heterogeneity with application to marked juvenile salmon. Statistical Modelling 3:157–177 (2003).
[6] Perry, R. W., J. R. Skalski, P. L. Brandes, P. T. Sandstrom, A. P. Klimley, A. Ammann, and B. MacFarlane. Estimating survival and migration route probabilities of juvenile Chinook salmon in the Sacramento-San Joaquin River Delta. North American Journal of Fisheries Management 30(1):142-156 (2010).
[7] California WaterFix Biological Opinion. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Service Center (NMFS), Long Beach, California. Appendix E. Analysis of UPP using Perry survival model. In California WaterFix Biological Opinion. National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Southwest

- Life Cycle Models (CHNWR only)
    - Interactive Object-oriented Salmon Simulation (IOS)
    - Oncorhynchus Bayesian Analysis (OBAN)
    - NMFS Winter Run Life Cycle Model (NMFS WRLCM)

Longfin Smelt

- Mount 2013[8] (outflow)

Delta Smelt and Longfin Smelt (habitat related, quantitative/qualitative analyses)

- Migration impedance and lost reproductive opportunity
- Changes in larval transport
- South Delta facilities-entrainment
- Microcystis
- Reduction in transport of food web materials
- Sediment removal and changes in turbidity
- Changes in abiotic habitat (X2)

McCloud River

Raising the water level behind Shasta Dam will convert part of the McCloud River into reservoir habitat, changing the free-flowing condition of the McCloud River. The Wild and Scenic Rivers Act specifically identifies the extraordinary resources of the McCloud River in that it supports one of the finest wild trout fisheries in the State, and affords specific protection through language prohibiting construction of water impoundment facilities on eligible river segments (Public Res. Code, § 5093.542). The Wild and Scenic Rivers Act prohibits State agencies or departments from assisting or cooperating in any way "in the planning or construction of any dam, reservoir, diversion, or other water impoundment facility that could have an adverse effect on the free-flowing condition of the McCloud River, or on its wild trout fishery." (Public Res. Code, § 5093.542, subd. (c).)

This segment of the McCloud River is also designated as a Wild Trout Water, and pursuant to Fish and Game Commission's Wild Trout Policy "All necessary actions, consistent with State law, shall be taken to prevent adverse impact by land or water development projects affecting designated Wild Trout Waters." The California Natural Resources Agency sent a letter, dated March 13, 2018, to members of Congress asking that they "not pursue the Shasta Dam enlargement project, which disregards California law." The Department's participation relative to Project impacts

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Fisheries Service Center (NMFS), Long Beach, California (2017). Available at: http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/CAWaterFix/WaterFix%20Biological%20Opinion/cwf_appendix_e.pdf

[8] Mount, J., W. Fleenor, B. Gray, B. Herbold, and W. Kimmerer. Panel Review of the draft Bay-Delta Conservation Plan. Prepared for the Nature Conservancy and American Rivers. September. Saracino & Mount, LLC, Sacramento, CA (2013).

has been, and continues to be, to protect and enhance fishery resources. Inundation of the McCloud River would result in a significant loss of this river ecosystem to a reservoir ecosystem, resulting in direct and indirect adverse impacts to the current trout fishery in conflict with State law and policy. Likely changes to the trout fishery would include a shift from riverine trout habitat to habitat that supports non-native lake dwelling fish species. The Department recommends the DEIR include alternatives that do not include raising the dam and affecting the McCloud River.

Terrestrial Resources

Several special status species and habitats are known to occur within this Project study area. The Department recommends updating all surveys over five years old, especially those for endangered, threatened, or candidate species to reflect new data and/or observations that may have occurred since the SLWRI FEIS studies were conducted. The California Natural Diversity Database (CNDDB), along with other electronic databases (California Native Plant Society and U.S. Fish and Wildlife Service) provide useful positive detection information for determining which species are potentially present on a site. This information should not substitute for updated surveys.

Vegetation mapping should be updated to reflect any newly listed sensitive natural communities (https://wildlife.ca.gov/Data/VegCAMP/Natural-Communities#sensitive%20natural%20communities). Vegetation types that are not on the State's sensitive list but that may be considered rare or unique to the region under CEQA Guidelines section 15125 (c), should also be analyzed. California Rare Plant Rank (CRPR) 1, 2 and 3 species should be analyzed within the DEIR.

Additionally, both the Carr and Hirz fires may have altered species and habitats likely to be affected by the proposed Project. The Department recommends the draft EIR describe the cumulative impacts the Project, combined with the fires, on wildlife, plant, and vegetation communities.

Maps depicting the proposed inundations of Comprehensive Plans 1 through 5 should be presented in the DEIR. These should be shown in separate figures for ease of comparison. The SLWRI FEIS and 2015 Feasibility Report do not show the inundation impacts. Further, the inundation layer should be overlaid on the known sensitive species observations.

A new scientific paper on Shasta salamander (*Hydromantes shastae*) (Bingham et al. 2018)[9] splits the species into three genetically distinct species. Though the

[9] Bingham, R. E., Papenfuss, T. J., Lindstrand, L. & Wake, D. B. Phylogeography and Species Boundaries In the Hydromantes shastae Complex, With Description of Two New Species (Amphibia; Caudata; Plethodontidae). Bulletin of the Museum of Comparative Zoology 161, 403–427 (2018).

CESA listing status for these has not been updated, all should be treated as a CESA threatened species. All three species, as identified in the Bingham paper would be impacted by the Project, but one in particular, *Hydromantes wintu*, occurs entirely between the Pit and McCloud River arms of Shasta Lake, and its range is likely less than 2,000 acres in size. The draft EIR should evaluate the potential of the Project to significantly impact these salamander species, and the potential to compromise the continued existence of *H. wintu*.

Foothill yellow-legged frog (*Rana boylii*) is currently a State candidate species, following a determination by the California Fish and Game Commission on June 21, 2017 that listing the species as threatened may be warranted. As such, foothill yellow-legged frog is afforded all the legal protections a State listed species during the candidacy period and the draft EIR should address the potential to substantially reduce the habitat or numbers or range of the species.

Thank you for the opportunity to comment. If you have any questions, please contact Curt Babcock at (530) 225-2740, or by e-mail at Curt.Babcock@wildlife.ca.gov.

Sincerely,

Tina Bartlett

Tina Bartlett
Regional Manager

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EXHIBIT F

Westlands Water District

Initial Study/Notice of Preparation

Shasta Dam Raise Project
Environmental Impact Report

November 2018

Subject: Notice of Preparation of a Draft Environmental Impact Report

Project Title: Shasta Dam Raise Project

Project Location: Shasta County

This Notice of Preparation has been prepared to notify agencies and interested parties that Westlands Water District (WWD), as Lead Agency under the California Environmental Quality Act (CEQA), will prepare an environmental impact report (EIR) for the Shasta Dam Raise Project. *This Initial Study/Notice of Preparation contains the proposed project description, location, and potential environmental impacts of implementing the project that WWD's preliminary evaluation has identified.*

Consistent with Public Resources Code Section 21092, your agency or organization is invited to provide comments concerning the scope and content of the EIR that is germane to the statutory responsibilities of your agency or organization in connection with the proposed project. If you do not represent an agency or organization, this notice has been sent to provide you an opportunity to comment on the scope of the review and to identify important issues you believe should be evaluated in the EIR. A written response to this Notice of Preparation will provide you the opportunity to identify and discuss these issues.

In addition, a public scoping meeting will be held to solicit public input on the scope of the environmental documentation, alternatives, concerns, and issues to be addressed in the EIR. The meeting date is as follows:

> Wednesday, December 12, 2018, 5:00 to 7:00 p.m., Holiday Inn Redding, Palomino Room, 1900 Hilltop Drive, Redding, CA

Written comments on the scope of the environmental document must be received on or before Friday, January 4, 2019 and should be sent to:

- *U.S. mail (postmarked by Jan. 4, 2019) or hand-delivery:*

  Shasta Dam Raise Project
  c/o: Stantec
  3301 C Street, Suite 1900
  Sacramento, CA 95816

- *Email:* shastadameir@stantec.com

Due to the time limits mandated by State law, your response must be sent at the earliest possible date, but not later than 30 days after receipt of this notice. Please include the contact person's full name and address in your response.

November 30, 2018

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Contents

Page

Tables

Figures

Abbreviations and Acronyms

AB 52	Assembly Bill 52
CEQA	California Environmental Quality Act
CP	comprehensive plan
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
Delta	Sacramento-San Joaquin River Delta
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
M&I	municipal and industrial
MAF	million acre feet
NEPA	National Environmental Policy Act
NGVD29	National Geodetic Vertical Datum 1929
NOP	Notice of Preparation
NRA	National Recreation Area
P&G	1983 U.S. Water Resources Council *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*
project	Shasta Dam Raise Project
RBPP	Red Bluff Pumping Plant
Reclamation	U.S. Department of Interior, Bureau of Reclamation
ROD	Record of Decision
SLWRI	Shasta Lake Water Resources Investigation
State	State of California
SWP	State Water Project
TCD	temperature control device

USFS	U.S. Department of Agriculture, Forest Service
WWD	Westlands Water District

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CHAPTER 1
PROJECT DESCRIPTION

1.1 Introduction

This Initial Study has been prepared by Westlands Water District (WWD) to preliminarily identify the types and potential significance of the environmental impacts of raising the existing Shasta Dam and expanding the existing Shasta Reservoir. The Shasta Dam Raise Project (project) is being evaluated pursuant to the California Environmental Quality Act (CEQA), and other pertinent federal, state, and local laws and policies, with WWD serving as the lead agency for compliance with CEQA.

1.1.1 Background and Previous Studies

The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) completed constructing Shasta Dam and Reservoir in 1945. Reclamation operates Shasta Dam and Reservoir, in conjunction with other facilities, to provide flood damage reduction and irrigation and municipal and industrial (M&I) water supply, maintain navigation flows, protect fish in the Sacramento River and the Sacramento-San Joaquin Delta (Delta), and generate hydropower. The Central Valley Project Improvement Act (CVPIA), enacted in 1992, added “fish and wildlife mitigation, protection, and restoration” as a priority equal to water supply, and “fish and wildlife enhancement” as a priority equal to hydropower generation. Major modifications to Shasta Dam include construction of a temperature control device (TCD) in 1997 for improved management of water temperatures in the upper Sacramento River.

Shasta Dam and Reservoir were constructed as an integral element of the Central Valley Project (CVP), with Shasta Reservoir representing about 41 percent of the total reservoir storage capacity of the CVP. The 602-foot-tall Shasta Dam (533 feet above the streambed) and 4.55 million-acre-foot (MAF) Shasta Reservoir are located on the upper Sacramento River in Northern California, north of the City of Redding (see Figure 1.1-1) within the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). Shasta Lake supports extensive water-oriented recreation. Recreation within the Shasta unit of the NRA is managed by U.S. Department of Agriculture, Forest Service (USFS).

Figure 1.1-1. Location of Shasta Dam and Reservoir

In 2000, as a result of the CALFED Programmatic Record of Decision (ROD), increasing demands for water supplies, and growing concerns over declines in ecosystem resources in the Central Valley of California, Reclamation reinitiated a feasibility investigation to evaluate the potential for enlarging Shasta Dam and Reservoir. This feasibility investigation became known as the Shasta Lake Water Resources Investigation (SLWRI).

The SLWRI was conducted consistent with the National Environmental Policy Act (NEPA), the 1983 U.S. Water Resources Council's *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G) (WRC 1983), and other pertinent Federal, State of California (State), and local laws and policies. Reclamation served as the Federal lead agency for compliance with NEPA. Cooperating agencies, pursuant to NEPA, included the USFS; Colusa Indian Community Council of the Cachil Dehe Band of Wintun Indians; U.S. Army Corps of Engineers; and U.S. Department of the Interior, Bureau of Indian Affairs.

Major previous Reclamation studies and reports investigating potential enlargement of Shasta Dam and Reservoir include *Enlarged Shasta Lake Investigation Preliminary Findings Report* (Reclamation 1983); *Shasta Dam and Reservoir Enlargement: Appraisal Assessment of the Potential for Enlarging Shasta Dam and Reservoir* (Reclamation 1999); *SLWRI Strategic Agency and Public Involvement Plan* (Reclamation 2003b); *SLWRI Mission Statement Milestone Report* (Reclamation 2003a); *SLWRI Initial Alternatives Information Report*

(Reclamation 2004); *SLWRI Environmental Scoping Report* (2006); *SLWRI Plan Formulation Report* (Reclamation 2007); *SLWRI Draft Feasibility Report* (Reclamation 2011); and *SLWRI Draft Environmental Impact Statement (EIS)* (Reclamation 2013).

Reclamation released the *SLWRI Final EIS* (Reclamation 2014) and *SLWRI Final Feasibility Report* (Reclamation 2015) to the public in 2015. The EIS was prepared in consideration of CEQA requirements. The Final SLWRI EIS and Feasibility Report are located on the Reclamation Mid-Pacific Region website at www.usbr.gov/mp/ncao/shasta-lake.html.

In March 2018, Congress directed $20.5 million in Water Infrastructure for Improvement to the Nation Act funding for Shasta Dam Raise Project pre-construction activities. These activities include:

- Engineering design for 18.5-foot dam raise;
- Coordination with various federal, state, railroad, and local agencies;
- Consultations with tribal interests, land-owners, and government and non-government agencies, and preparing various required documents;
- Identifying non-federal cost share partner(s); and
- Public involvement and stakeholder outreach.

Reclamation initiated pre-construction activities in April 2018.

1.1.2 Westlands Water District

WWD is the largest agricultural water district in the United States, made up of more than 1,000 square miles of prime farmland in western Fresno and Kings Counties. WWD has federal contracts to provide water to 700 family-owned farms that average 875 acres in size. These farms produce more than 60 different high-quality commercial food and fiber crops sold for the fresh, dry, canned, and frozen food markets, domestically and abroad. More than 50,000 people live and work in the communities that depend on WWD's agricultural economy.

Water is delivered to WWD through the CVP. After it is released from CVP reservoirs, the water is pumped from the Sacramento-San Joaquin River Delta and delivered 70 miles through the Delta-Mendota Canal to San Luis Reservoir. During the spring and summer, the water is released from San Luis Reservoir and delivered to WWD through the San Luis Canal and the Coalinga Canal. Once it leaves the federal project canals, water is delivered to farms through 1,034 miles of underground pipe and more than 3,300 water meters.

As the CEQA lead agency, WWD determined that the Shasta Dam Raise Project has the potential to result in significant environmental effects, and is preparing an EIR for the project.

1.2 Project Setting

Shasta Dam and Shasta Lake are located on the upper Sacramento River in Northern California, approximately 9 miles northwest of Redding in Shasta County. Because of the potential influence of the proposed modification of Shasta Dam and subsequent system operations and water deliveries on resources over a large geographic area, the project includes both a primary study area and an extended study area. As shown in Figure 1.2-1a, the primary study area includes Shasta Dam and Lake; the lower portions of all contributing major and minor tributaries flowing into Shasta Lake; Trinity and Lewiston reservoirs; and the Sacramento River between Shasta Dam and the Red Bluff Pumping Plant (RBPP), including tributaries at their confluence. The extended study area includes the Sacramento River downstream from the RBPP, including portions of the American and Feather river basins downstream from CVP/State Water Project (SWP) reservoirs and related facilities; the San Francisco Bay/Sacramento-San Joaquin Delta; lower portions of the San Joaquin River basin downstream from CVP reservoirs and related facilities (Friant and New Melones reservoirs); and CVP and SWP facilities and water service areas (shown in Figure 1.2-1b).

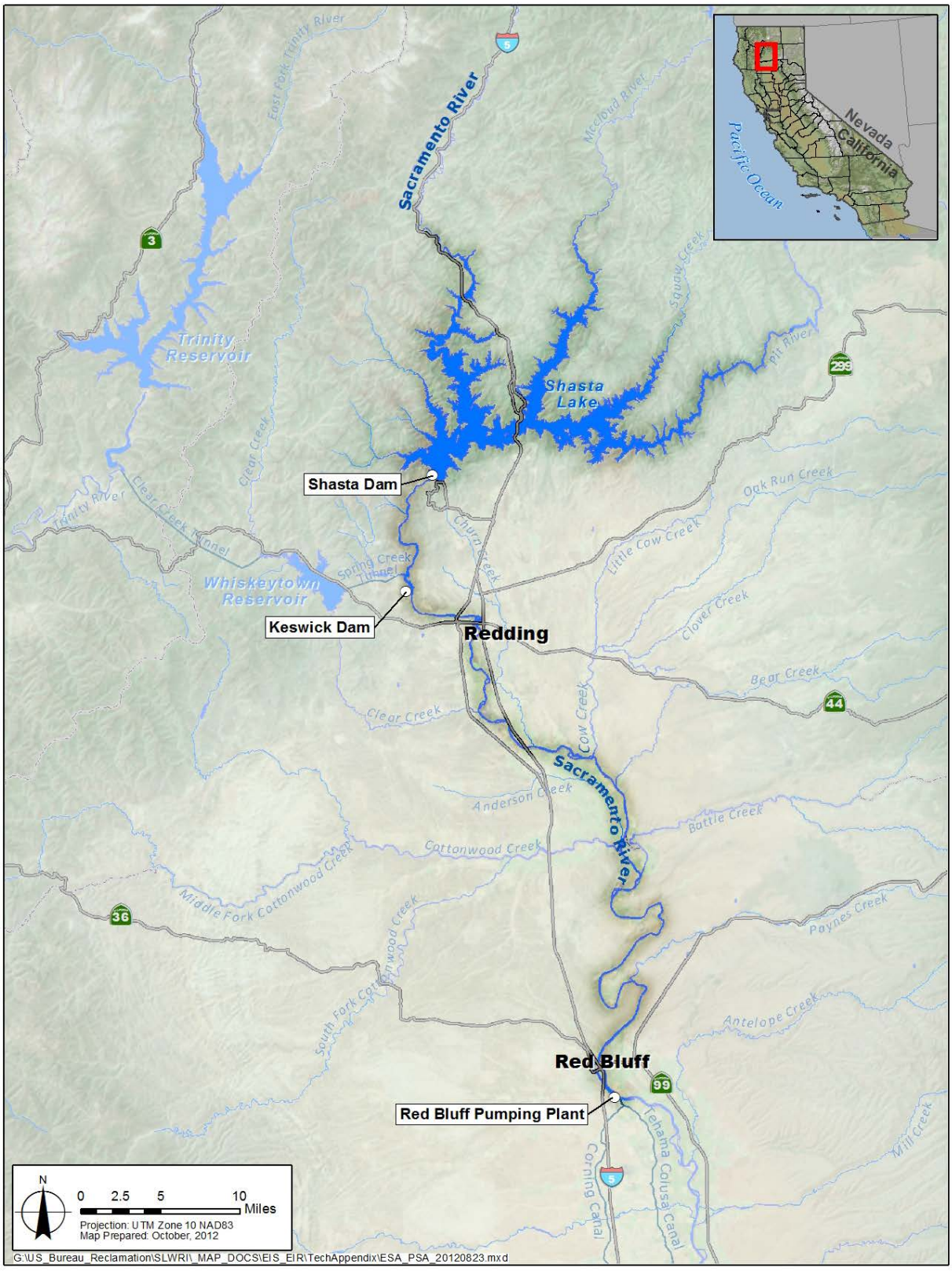

Figure 1.2-1a. Primary Study Area – Shasta Lake Area and Sacramento River from Shasta Dam to Red Bluff Pumping Plant

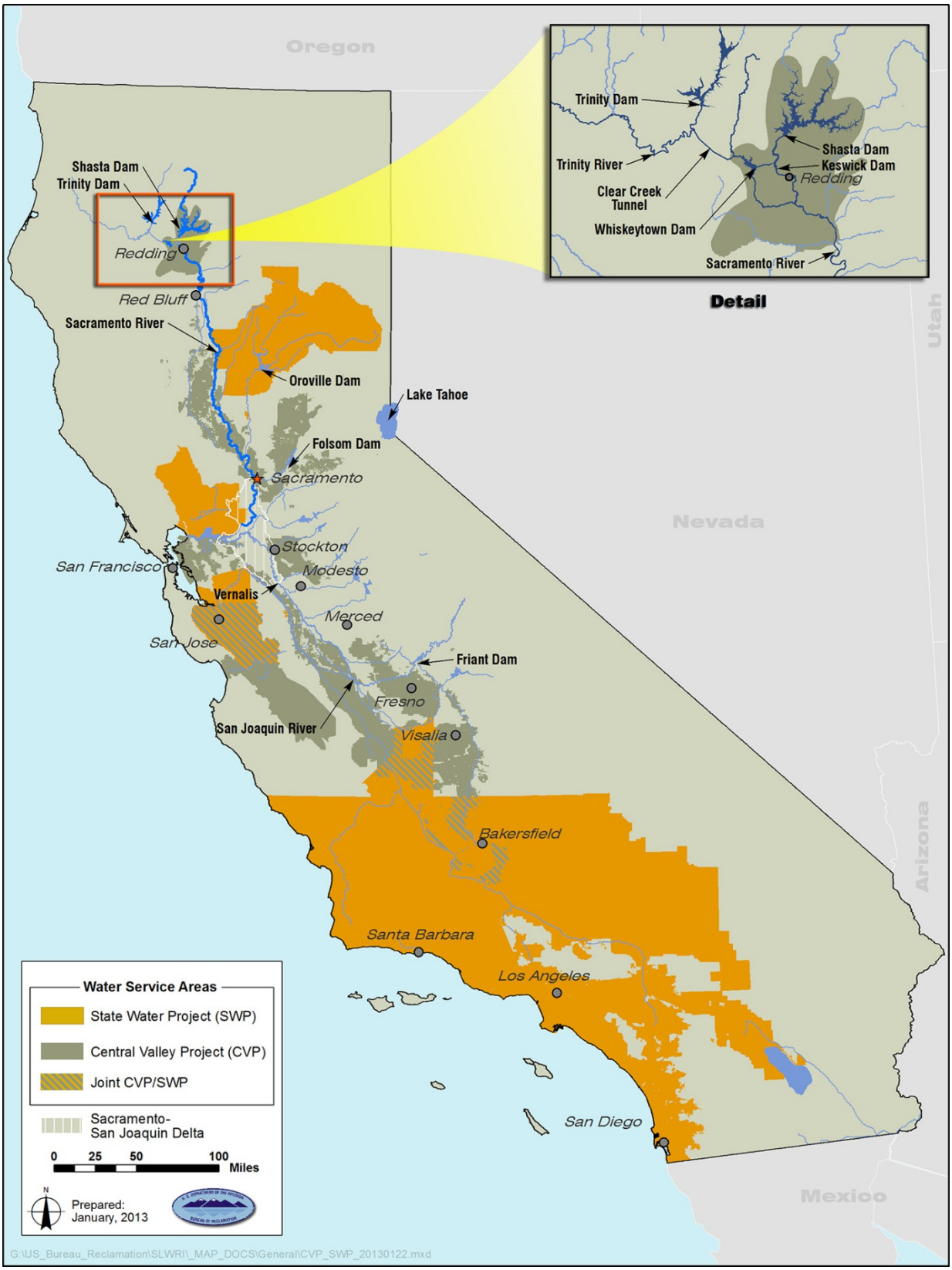

Figure 1.2-1b. Central Valley Project and State Water Project Facilities and Water Service Areas

1.3 Project Objectives

This project has two primary objectives and five secondary objectives to optimize the water supply benefits and improve environmental water management of Shasta Dam and Reservoir:

Primary Objectives

- Increase the survival of anadromous fish populations in the Sacramento River, primarily upstream from the RBPP
- Increase water supply and water supply reliability for agricultural, M&I, and environmental purposes to help meet current and future water demands

Secondary Objectives

- Conserve, restore, and enhance ecosystem resources in the Shasta Lake area and along the upper Sacramento River
- Reduce flood damage along the Sacramento River
- Develop additional hydropower generation capabilities at Shasta Dam
- Maintain and increase recreation opportunities at Shasta Lake
- Maintain or improve water quality conditions in the Sacramento River downstream from Shasta Dam and in the Delta

1.4 Project Description

In addition to the No Project Alternative, six action alternatives are anticipated to be evaluated in the project EIR. These six action alternatives were described in the 2014 Final SLWRI EIS, Chapter 2, “Alternatives.” Additional refinements to these action alternatives may occur through the CEQA process. In the Final SLWRI Feasibility Report and Final EIS, these action alternatives are referred to as comprehensive plans. For ease of reference, WWD anticipates the Draft EIR will use similar terminology.

Each of the comprehensive plans includes enlarging Shasta Dam and Reservoir and a variety of management measures aimed to address the project objectives. All of the comprehensive plans include eight common management measures:

- **Enlarge Shasta Lake cold-water pool** – All action alternatives would involve enlarging the cold-water pool by raising Shasta Dam to enlarge Shasta Reservoir.
- **Modify temperature control device** – Minimum modifications to the TCD under all action alternatives would include raising the existing structure and modifying the shutter control.
- **Increase conservation storage** – All action alternatives would increase the conservation storage in Shasta Reservoir by raising Shasta Dam.

- **Reduce demand** – All action alternatives would include a water conservation program to augment current water use efficiency practices.

- **Modify flood operations** – Enlarging Shasta Reservoir would require adjustment of the existing flood operation guidelines, or rule curves, to reflect physical modifications, such as an increase in dam/spillway elevation; the rule curves would be revised with the goal of reducing flood damage and enhancing other objectives to the extent feasible.

- **Modify hydropower facilities** – Enlarging Shasta Dam would require various modifications to the dam's existing hydropower facilities to enable their continued efficient use.

- **Maintain and increase recreation opportunities** – Recreation is important to the Shasta Lake region; therefore, existing recreation opportunities would be maintained and/or increased under all action alternatives.

- **Maintain or improve water quality** – All action alternatives would maintain and potentially improve water quality by increasing Delta outflow during drought years and reducing salinity during critical periods, and may also provide additional operational flexibility for responses to Delta emergencies.

1.4.1 Comprehensive Plan 1 (CP1) – 6.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

	CP1
Dam Raise	6.5 feet
Increased Storage	256,000 acre-feet
Focus	Anadromous Fish Survival & Water Supply Reliability
Major Components	Dam Modifications & Reservoir Area Relocations
	Mitigation Measures

Comprehensive Plan (CP)1 focuses on both anadromous fish survival and water supply reliability. This alternative primarily consists of enlarging Shasta Dam by raising the crest 6.5 feet and implementing the set of eight common management measures described above. CP1 would also include and mitigation measures. By raising Shasta Dam from a crest at elevation 1,077.5 feet above mean sea level (elevation 1,077.5) to elevation 1,084.0 (based on the National Geodetic Vertical Datum 1929 (NGVD29)),[1] in combination with spillway modifications, this alternative would increase the height of the reservoir's full pool by 8.5 feet. This increase in full pool height would add approximately 256,000 acre-feet of additional storage to the overall reservoir capacity. Accordingly, the overall full pool storage would increase from 4.55 MAF to 4.81 MAF.

Under CP1, the additional storage in Shasta Reservoir would be used to increase water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. Enlarging Shasta Reservoir would increase the depth and volume of the cold-water pool, improving

[1] Dam crest elevations are based on NGVD29. All current feasibility-level designs and figures for Shasta Dam and appurtenant structures are based on NGVD29.

Reclamation's ability to release cold water from Shasta Dam and regulate seasonal water temperatures for fish in the upper Sacramento River during critical periods. This alternative (and all action alternatives) includes extending the existing TCD for efficient use of the expanded cold-water pool. CP1 would increase water supply reliability for agricultural, M&I, and environmental purposes. CP1 would also help reduce future water shortages by increasing irrigation and M&I deliveries, primarily during drought periods.

CP1 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP1 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP1, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. In dry years, 70,000 acre-feet of the 256,000 acre-feet increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. In critical years, 35,000 acre-feet of the increased storage capacity would be reserved for increasing M&I deliveries.

1.4.2 Comprehensive Plan 2 (CP2) – 12.5-Foot Dam Raise, Anadromous Fish Survival and Water Supply Reliability

	CP2
Dam Raise	*12.5 feet*
Increased Storage	*443,000 acre-feet*
Focus	*Anadromous Fish Survival & Water Supply Reliability*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Mitigation Measures

CP2 focuses on both anadromous fish survival and water supply reliability. This alternative primarily consists of enlarging Shasta Dam by raising the crest 12.5 feet and implementing the set of eight common management measures described above. CP2 would also include mitigation measures. A dam raise of 12.5 feet was chosen because it represents a midpoint between the likely smallest dam raise considered and the largest practical dam raise that would not require relocating the Pit River Bridge. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,090.0 (NGVD29), in combination with spillway modifications, CP2 would increase the height of the reservoir's full pool by 14.5 feet. This increase in full pool height would add approximately 443,000 acre-feet of storage to the reservoir's capacity. Accordingly, storage in the overall full pool would increase from 4.55 MAF to 5.0 MAF.

Under CP2, the additional storage in Shasta Reservoir would be used to increase water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. CP2 would increase the ability of Shasta Dam to regulate seasonal water temperatures for fish, primarily during critical periods, and would increase water supply reliability for agricultural, M&I, and environmental purposes. CP2 would also help reduce future water shortages through increasing irrigation and M&I deliveries, primarily during drought periods.

CP2 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP2 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP2, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. In dry years, 120,000 acre-feet of the 443,000 acre-feet increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. In critical years,

60,000 acre-feet of the increased storage capacity would be reserved for increasing M&I deliveries.

1.4.3 Comprehensive Plan (CP3) – 18.5-Foot Dam Raise, Agricultural Water Supply Reliability and Anadromous Fish Survival

CP3 focuses on both agricultural water supply reliability and anadromous fish survival. This alternative primarily consists of enlarging Shasta Dam and Reservoir by raising the dam crest 18.5 feet and implementing the set of eight common management measures described above. CP3 would also include mitigation measures.

	CP3
Dam Raise	*18.5 feet*
Increased Storage	*634,000 acre-feet*
Focus	*Agricultural Water Supply Reliability & Anadromous Fish Survival*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Mitigation Measures

By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0 (NGVD29), in combination with spillway modifications, CP3 would increase the height of the reservoir's full pool by 20.5 feet. This increase in full pool height would add approximately 634,000 acre-feet of storage to the reservoir's capacity. Accordingly, storage in the overall full pool would be increased from 4.55 MAF to 5.19 MAF. Although higher dam raises are technically and physically feasible, 18.5 feet is the largest dam raise that would not require extensive and costly reservoir area relocations, such as relocating the Pit River Bridge, Interstate 5, and the Union Pacific Railroad tunnels.

Because CP3 focuses on increasing agricultural water supply reliability and anadromous fish survival, none of the increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations. The additional storage would be retained for water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. CP3 would increase the ability of Shasta Dam to regulate seasonal water temperatures for fish, primarily during critical periods, and would increase water supply reliability for agricultural, M&I, and environmental purposes. CP3 would also help reduce future water shortages through increasing irrigation deliveries.

CP3 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP3 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP3, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility

for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

1.4.4 Comprehensive Plan 4 (CP4) and Comprehensive Plan 4A (CP4A) – 18.5-Foot Dam Raise, Anadromous Fish Focus with Water Supply Reliability

CP4 and CP4A focus on increasing anadromous fish survival, while also increasing water supply reliability. CP4 and CP4A are identical except for Shasta Dam and reservoir operations. CP4 and CP4A have similar reservoir operations in that they each dedicate a portion of the new storage in Shasta Lake for fisheries purposes; however, the portion of this dedicated storage varies.

	CP4 and CP4A
Dam Raise	*18.5 feet*
Increased Storage	*634,000 acre-feet*
Focus	*Anadromous Fish Survival with Water Supply Reliability*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Adaptive Management *CP4 –Reserving 378,000 acre-feet of Storage for Cold-Water Pool* *CP4A – Reserving 191,000 acre-feet of Storage for Cold-Water Pool*
	Augment Spawning Gravel
	Restore Riparian, Floodplain, & Side Channel Habitat

These alternatives primarily consist of enlarging Shasta Dam and Reservoir by raising the dam crest 18.5 feet and implementing the set of eight common management measures described above. CP4 and CP4A would also include mitigation measures. In addition, CP4 and CP4A would dedicate a portion of the increased storage in Shasta Reservoir for maintaining cold-water volumes to benefit anadromous fish in the upper Sacramento River. CP4 and CP4A also include two additional ecosystem restoration features: (1) augmenting spawning gravel in the upper Sacramento River at targeted locations to provide either immediate spawning habitat or long-term recruitment, and (2) restoring riparian, floodplain, and side channel habitat in the upper Sacramento River to provide rearing habitat for juvenile salmonids.

The additional storage created by the 18.5-foot dam raise would be used to improve the ability to meet water temperature objectives and habitat requirements for anadromous fish during drought years and increase water supply reliability. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0 (NGVD29), in combination with spillway modifications, CP4 and CP4A would increase the overall full pool storage from 4.55 MAF to 5.19 MAF. Of the increased reservoir storage space, about 378,000 acre-feet would be dedicated to increasing the supply of cold water for anadromous fish survival purposes in CP4; 191,000 acre-feet would be dedicated in CP4A. Operations of the cold-water pool would be subject to an adaptive management plan that may include operational changes to the timing and magnitude of release from Shasta Dam to benefit anadromous fish. For CP4, operations for the remaining portion of increased storage (approximately 256,000 acre-feet) would be the same as for CP1, with 70,000 acre-feet reserved in dry years and 35,000 acre-feet reserved in critical years to specifically focus on increasing M&I deliveries. For CP4A, operations for the remaining portion of increased storage (approximately 443,000 acre-feet) would be the same as in CP2, with 120,000 acre-feet reserved in dry years and 60,000 acre-feet reserved in critical years to specifically focus on increasing M&I deliveries.

CP4 and CP4A also address secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP4 and CP4A include features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP4 and CP4A, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

1.4.5 Comprehensive Plan 5 (CP5) – 18.5-Foot Dam Raise, Combination Plan

	CP5
Dam Raise	*18.5 feet*
Increased Storage	*634,000 acre-feet*
Focus	*Water Supply Reliability, Anadromous Fish Survival, Ecosystem Restoration, and Recreation*
Major Components	*Dam Modifications & Reservoir Area Relocations*
	Construct Resident Fish Habitat at Shasta Lake & along Tributaries
	Augment Spawning Gravel
	Restore Riparian, Floodplain, & Side Channel Habitat
	Increase Recreation Opportunities

CP5 focuses on anadromous fish survival, increased water supply reliability, ecosystem enhancements in the Shasta Lake area and the upper Sacramento River upstream from the RBPP, and increased recreation opportunities around Shasta Lake. This alternative primarily consists of raising Shasta Dam 18.5 feet; implementing the set of eight common management measures described above; constructing additional resident fish habitat in Shasta Lake and along the lower reaches of its tributaries (the Sacramento River, the McCloud River, and Squaw Creek); constructing shoreline fish habitat around Shasta Lake; augmenting spawning gravel in the upper Sacramento River; restoring riparian, floodplain, and side channel habitat in the upper Sacramento River; and increasing recreation opportunities at Shasta Lake. CP5 would also include mitigation measures. By raising Shasta Dam from a crest at elevation 1,077.5 to elevation 1,096.0 (NGVD29), in combination with spillway modifications, CP5 would increase the height of the reservoir's full pool by 20.5 feet, increasing the overall full pool storage from 4.55 MAF to 5.19 MAF.

Under CP5, the additional storage in Shasta Reservoir would be used to increase water supply reliability and to expand the cold-water pool for downstream anadromous fisheries. Enlarging Shasta Reservoir would increase the depth and volume of the cold-water pool, increasing the ability of Reclamation to release cold water from Shasta Dam and regulate seasonal water temperatures for fish in the upper Sacramento River during critical periods. This alternative (and

all action alternatives) includes extending the existing TCD for efficient use of the expanded cold-water pool. CP5 would increase water supply reliability for agricultural, M&I, and environmental purposes. CP5 would also help reduce future water shortages through increasing irrigation and M&I deliveries, primarily during drought periods.

CP5 also addresses secondary planning objectives related to hydropower generation, recreation, flood damage reduction, ecosystem restoration, and water quality. Higher water surface elevations in the reservoir would result in an increase in power generation. CP5 includes features to at least maintain the existing recreation capacity at Shasta Lake, and water-oriented recreation experiences would be enhanced due to an increase in average lake surface area, reduced drawdown during the recreation season, and modernization of recreation facilities. Enlarging Shasta Dam would provide for incidental increased reservoir capacity to capture flood flows, which could reduce flood damage along the upper Sacramento River. Improved fisheries conditions as a result of CP5, and increased flexibility to meet flow and temperature requirements, could also enhance overall ecosystem resources in the Sacramento River. Additional storage in Shasta Reservoir would also provide improved operational flexibility for meeting Delta water quality objectives through increased and/or high-flow releases to improve Delta water quality.

Operations for water supply, hydropower, and environmental and other regulatory requirements would be similar to existing operations, except during dry and critical years when a portion of the increased storage in Shasta Reservoir would be reserved to specifically focus on increasing M&I deliveries. In dry years, 150,000 acre-feet of the 634,000 acre-feet increased storage capacity in Shasta Reservoir would be reserved for increasing M&I deliveries. In critical years, 75,000 acre-feet of the increased storage capacity would be reserved for increasing M&I deliveries.

1.4.6 Summary of Comprehensive Plan Physical Features

The following sections describe the physical features of the comprehensive plans (action alternatives).

Physical Features
The comprehensive plans (action alternatives) involve raising Shasta Dam by 6.5 feet to 18.5 feet, increasing the storage capacity in Shasta Reservoir by 256,000 acre-feet to 634,000 acre-feet, and constructing a common set of features, as shown in Table 1.4-6. Features and related construction activities under all comprehensive plans would include the following:

- Clearing vegetation from portions of the inundated reservoir area
- Constructing the dam, appurtenant structures, reservoir area dikes, and railroad embankments
- Relocating roadways, bridges, recreation facilities, utilities, and miscellaneous minor infrastructure

Table 1.4-6. Summary of Physical Features of Action Alternatives

	Action Alternatives					
Main Features	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Dam and Appurtenant Structures						
Shasta Dam						
Crest Raise (feet)	6.5	12.5	18.5	18.5	18.5	18.5
Full Pool Height Increase (feet)	8.5	14.5	20.5	20.5	20.5	20.5
Elevation of Dam Crest (feet)[1]	1084.0	1090.0	1096.0	1096.0	1096.0	1096.0
Elevation of Full Pool (feet)[2]	1,078.2	1,084.2	1,090.2	1,090.2	1,090.2	1,090.2
Capacity Increase (acre-feet)	256,000	443,000	634,000	634,000	634,000	634,000
Main Dam	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.	Raise dam crest. Construct new parapets and utility gallery. Raise existing elevator tower and hoist tower.
Wing Dams	Raise to meet dam crest. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Relocate gantry crane on right wing dam.	Raise to meet dam crest. Relocate gantry crane on right wing dam.
Spillway	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.	Raise crest and extend piers. Replace 3 drum gates with 6 sloping fixed-wheel gates.
River Outlets	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.	Replace 4 lower-tier tube valves with jet flow gates.
Temperature Control Device	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.	Raise/modify controls.
Shasta Powerplant/ Penstocks	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.	Raise penstock hoists.

Table 1.4-6. Summary of Physical Features of Action Alternatives (contd.)

	Action Alternatives					
Main Features	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Pit 7 Dam/Powerhouse	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.	Increase height of training walls on dam spillway. Install a tailwater depression system. Modify other Pit 7 ancillary facilities.
Reservoir Area Clearing	Clear 150 acres completely and 220 acres with overstory removal.	Clear 240 acres completely and 350 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.	Clear 340 acres completely and 500 acres with overstory removal.
Reservoir Area Dikes and Railroad Embankments	Construct 3 railroad embankments and 2 new dikes.	Construct 3 railroad embankments and 3 new dikes.	Construct 3 railroad embankments and 4 new dikes.	Construct 3 railroad embankments and 4 new dikes.	Construct 3 railroad embankments and 4 new dikes.	Construct 3 railroad embankments and 4 new dikes.
Relocations						
Roadways	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.	Match replacement widths to existing paved roads to be replaced.
Length of Relocated Roadway (linear feet)	16,700	28,400	33,100	33,100	33,100	33,100
Number of Road Segments Affected	10	21	30	30	30	30
Vehicle Bridges	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.	Relocate 4 bridges, modify 1 bridge.
Railroad	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge	Relocate 2 bridges and realign track in-between, modify 1 bridge
Recreation Facilities	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 202 campsites/day-use sites/RV sites, 2 USFS facilities, 8.1 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 261 campsites/ day-use sites/RV sites, 2 USFS facilities, 9.9 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads.	Modify or replace 9 marinas, 6 public boat ramps, 6 resorts, 328 campgrounds/day-use areas/RV sites, 2 USFS facilities, 11.6 miles of trail, and 2 trailheads. Add 6 trailheads and 18 miles of new hiking trails.
Utilities	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.	Relocate inundated utilities. Construct wastewater treatment facilities.

Table 1.4-6. Summary of Physical Features of Action Alternatives (contd.)

Action Alternatives						
Main Features	**CP1**	**CP2**	**CP3**	**CP4**	**CP4A**	**CP5**
Ecosystem Enhancements	None	None	None	Reserve 378 TAF of the additional storage for cold-water supply for anadromous fish. Implement adaptive management plan to benefit anadromous fish. Augment spawning gravel in the upper Sacramento River at the rate of up to 10,000 tons per year. Restore riparian, floodplain, and side channel habitat along the upper Sacramento River.	Reserve 191 TAF of the additional storage for cold-water supply for anadromous fish. Implement adaptive management plan to benefit anadromous fish. Augment spawning gravel in the upper Sacramento River at the rate of up to 10,000 tons per year. Restore riparian, floodplain, and side channel habitat along the upper Sacramento River.	Construct shoreline fish habitat around Shasta Lake. Enhance aquatic habitat in tributaries to Shasta Lake to improve fish passage. Augment spawning gravel in the upper Sacramento River at the rate of up to 10,000 tons per year. Restore riparian, floodplain, and side channel habitat along the upper Sacramento River.

Notes:
[1] Dam crest elevations are based on the National Geodetic Vertical Datum of 1929 (NGVD29). All current feasibility-level designs and figures for Shasta Dam and appurtenant structures are based on NGVD29.
[2] Full pool elevations are based on the North American Vertical Datum of 1988 (NAVD88), which is 2.66 feet higher than NGVD29. All current feasibility-level designs and figures for reservoir area infrastructure modifications and relocations to accommodate increased water levels are based on a 2001 aerial survey of the reservoir using NAVD88.

Key:
CP = comprehensive plan
RV = recreational vehicle
TAF = thousand acre-feet
USFS = U.S. Department of Agriculture, Forest Service

Comprehensive plans CP4, CP4A, and CP5 would also include features and related construction activities associated with gravel augmentation and restoring riparian, floodplain, and side channel habitat along the upper Sacramento River. Additional features and related construction activities associated with Shasta Lake and tributary shoreline enhancements and features to increase Shasta Lake recreation opportunities are included under CP5. Figure 1.4-6 shows major features in the Shasta Lake area common to all comprehensive plans.

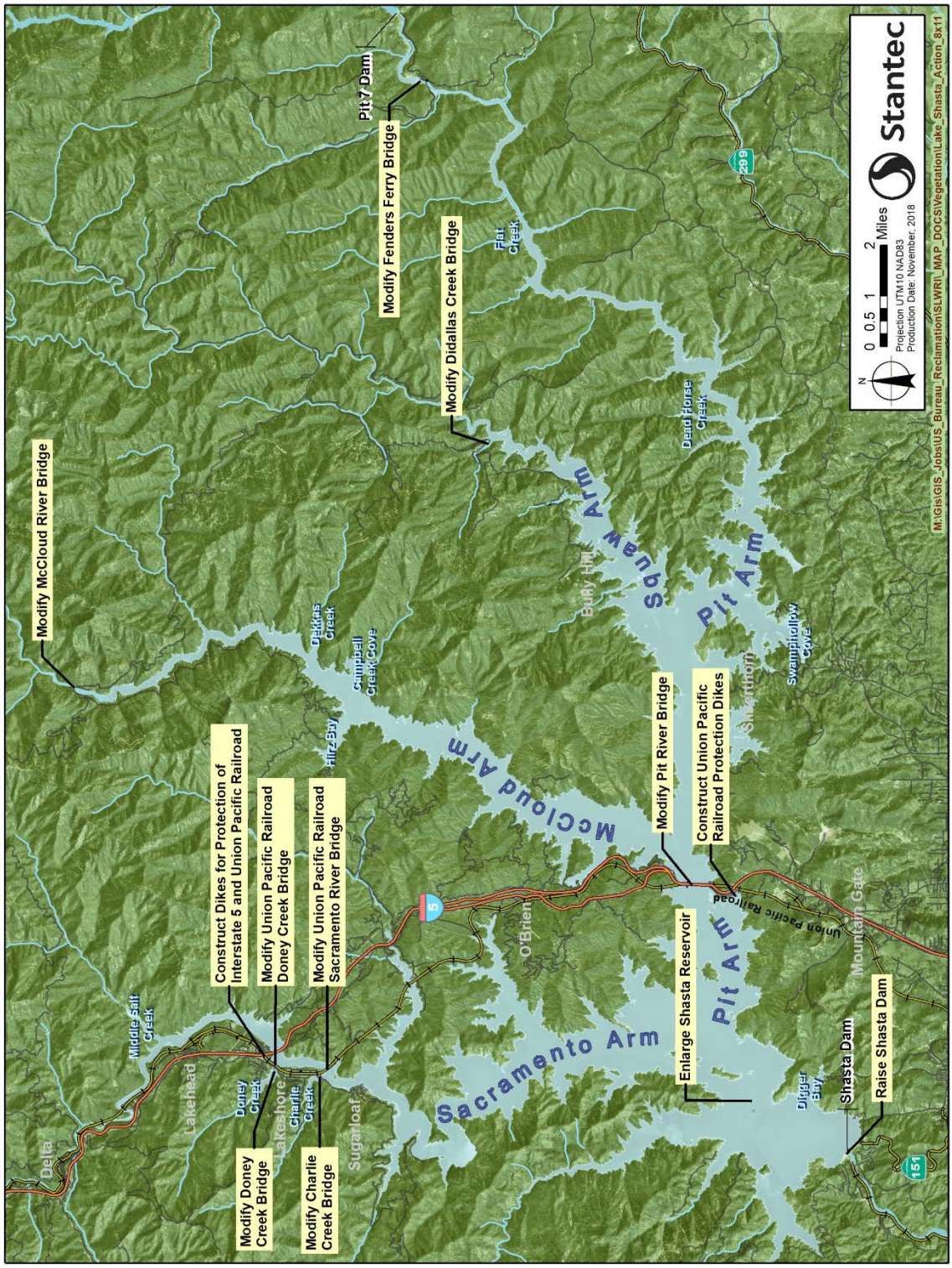

Figure 1.4-6. Major Features Common to All Action Alternatives

1.5 Environmental Review

The EIR prepared by WWD for this project will be used by WWD and, potentially, other agencies to make the CEQA discretionary decisions necessary for project authorization and implementation consistent with federal, state and local agency requirements.

1.5.1 Topics to be Analyzed in EIR

Based on the potential for the proposed project to result in significant impacts on the environment, WWD determined that an EIR is the appropriate level of environmental review. The EIR will assess the proposed project's effects on the environment and identify potentially significant impacts and feasible mitigation measures to reduce or eliminate those impacts. An alternatives analysis for the proposed project will also be included in the EIR. Topics to be analyzed in the EIR, include, but are not necessarily limited to the following: aesthetics, agriculture and forestry resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, transportation and traffic, tribal cultural resources, and utilities and service systems. Comments on the Notice of Preparation (NOP) may modify or add to the preliminary assessment of potential issues that will be addressed in the EIR.

1.5.2 Environmental Procedures

The NOP initiates the CEQA process, through which WWD will refine the range of issues and project alternatives to be addressed in the Draft EIR. Please submit any comments on the NOP and the scope of issues to be included in the EIR within 30 days of receipt of this notice (see contact information below). After the 30-day review period for the NOP is complete and all comments have been received, a Draft EIR will be prepared in accordance with CEQA.

Once the Draft EIR is completed, it will be made available for a 45-day public review and comment period. Copies of the Draft EIR will be sent directly to those agencies commenting on the NOP and will also be made available to the public at several locations, including WWD headquarters. Information about the availability of the Draft EIR will also be posted on WWD's website (https://wwd.ca.gov/).

1.6 Contact Information

For further information, please contact:

Kirsten Pringle
Associate Public Affairs Specialist

Attn: Stantec
3301 C Street, Suite 1900
Sacramento, CA 95816
E: shastadameir@stantec.com

Additional information relevant to the project and the Draft EIR can be found at https://wwd.ca.gov/.

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CHAPTER 2
ENVIRONMENTAL EVALUATION

2.1 Overview

Project Title:	**Shasta Dam Raise Project**
Lead agency name and address:	Westlands Water District 3130 N. Fresno Street P.O. Box 6056 Fresno, CA 93703-6056
Contact person and phone number:	Jose Gutierrez, Assistant Chief Operating Officer, Westlands Water District, (559) 241-6215
Project location:	Shasta Dam and Shasta Lake are located on the upper Sacramento River in Northern California, approximately 9 miles northwest of Redding in Shasta County. Because of the potential influence of the proposed modification of Shasta Dam and subsequent system operations and water deliveries on resources over a large geographic area, the project includes both a primary study area and an extended study area. The primary study area includes Shasta Dam and Lake; the lower portions of all contributing major and minor tributaries flowing into Shasta Lake; Trinity and Lewiston reservoirs; and the Sacramento River between Shasta Dam and the RBPP, including tributaries at their confluences. The extended study area includes the Sacramento River downstream from the RBPP, including portions of the American and Feather river basins downstream from CVP/SWP reservoirs and related facilities; the San Francisco Bay/Sacramento-San Joaquin Delta; lower portions of the San Joaquin River basin downstream from CVP reservoirs and related facilities (Friant and New Melones reservoirs); and CVP and SWP facilities and water service areas.
Project sponsor's name and address:	Westlands Water District 3130 N. Fresno Street P.O. Box 6056 Fresno, CA 93703-6056
Land designation:	Land uses in the Shasta Lake and vicinity portion of the primary study area consist primarily of open space and other land uses that support recreational activities in the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area. This includes riparian reserves and some commercial land. Residential land uses in this area typically characterized as low density and rural. Land uses in the upper Sacramento River area consist of urban, residential, municipal and industrial, and agricultural uses. Land uses in the extended study area vary greatly and include agricultural, open space, low to medium density residential, and recreational.

Key:
CVP = Central Valley Project
RBPP = Red Bluff Pumping Plant
SWP = State Water Project

2.2 Environmental Checklist Evaluation

The following preliminary evaluation of potential environmental effects was prepared for the Shasta Dam Raise Project consistent with the Environmental Checklist Form provided in Appendix G of the CEQA Guidelines.

2.2.1 Aesthetics

Table 2.2-1a shows preliminary impact determinations for the items in the Environmental Checklist Form related to aesthetics. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-1b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to aesthetics. The first column in Table 2.2-1b correlates to the questions for aesthetics in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-1a. Aesthetics Section from CEQA Guidelines Appendix G – Environmental Checklist Form

I. AESTHETICS: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Have a substantial adverse effect on a scenic vista?	☒	☐	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a designated scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☒	☐	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☒	☐	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-1b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Aesthetics

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 18, "Aesthetics and Visual Resources"[1] Section 18.3, "Environmental Consequences and Mitigation Measures"					
a, c	Impact Vis-2: Degradation and/or Obstruction of a Scenic View from Key Observation Points (Shasta Lake and Vicinity and Upper Sacramento River)	☒	☐	☐	☐
d	Impact Vis-3: Generation of Increased Daytime Glare and/or Nighttime Lighting (Shasta Lake and Vicinity and Upper Sacramento River)	☒	☐	☐	☐
b	Impact Vis-4: Consistency with Federal and State Scenic Highway Requirements (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☐	☒	☐

Note:
[1] Impact Vis-1 is included in Table 2.2-10b in Section 2.2.10, "Land Use and Planning," of this chapter.
Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.2 Agriculture and Forestry Resources

Table 2.2-2a shows preliminary impact determinations for the items in the Environmental Checklist Form related to agricultural and forestry resources. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-2b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to agriculture and forestry resources. The first column in Table 2.2-2b correlates to the questions for agriculture and forestry resources in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

CEQA Guidelines question c for Agriculture and Forestry Resources (e.g., forest and timberland zoning) was considered in the 2014 SLWRI Final EIS. As described in Section 10.3.3 of Chapter 10, “Agricultural and Important Farmland,” (Topics Eliminated from Further Discussion) of the SLWRI Final EIS, none of the lands in the primary study area are zoned forest land, timberland, or timberland zoned Timberland Production in the *Shasta County General Plan* (2004) or the *Tehama County General Plan* (2009). Increasing water supply reliability in the lower Sacramento River to the Delta and in the CVP/SWP service areas would not conflict with existing zoning or directly result in the rezoning of forest land, timberland, or timberland zoned Timberland Production. Therefore, no effects related to conflicts with existing zoning or causing rezoning of forest land are expected to occur in the study area. Accordingly, the EIR is not anticipated to address CEQA Guidelines Question c for Agriculture and Forestry Resources (see Table 2.2-2a).

Table 2.2-2a. Agriculture and Forestry Resources Section from CEQA Guidelines Appendix G – Environmental Checklist Form

II. AGRICULTURE AND FORESTRY RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☒	☐
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☒	☐
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Protection (as defined by Government Code section 51104(g)?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☒	☐	☐	☐
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non- forest use?	☒	☐	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-2b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Agriculture and Forestry Resources

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 10, "Agriculture and Important Farmland" Section 10.3, "Environmental Consequences and Mitigation Measures"					
a, b, e	Impact Ag-1: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Vicinity of Shasta Lake	☐	☐	☐	☒
d, e	Impact Ag-2: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Vicinity of Shasta Lake	☒	☐	☐	☐
a, b, e	Impact Ag-3: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts Along the Upper Sacramento River	☐	☐	☒	☐
d, e	Impact Ag-4: Direct and Indirect Conversion of Forest Land to Nonforest Uses Along the Upper Sacramento River	☐	☐	☒	☐
a, b, e	Impact Ag-5: Direct and Indirect Conversion of Important Farmland to Nonagricultural Uses and Cancellation of Williamson Act Contracts in the Extended Study Area	☐	☐	☒	☐
d	Impact Ag-6: Direct and Indirect Conversion of Forest Land to Nonforest Uses in the Extended Study Area	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.3 Air Quality

Table 2.2-3a shows preliminary impact determinations for the items in the Environmental Checklist Form related to air quality. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-3b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to air quality. The first column in Table 2.2-3b correlates to the questions for air quality in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-3a. Air Quality Section from CEQA Guidelines Appendix G – Environmental Checklist Form

III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Conflict with or obstruct implementation of applicable air quality plans?	☒	☐	☐	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-3b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Air Quality

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 5, "Air Quality and Climate" Section 5.3, "Environmental Consequences and Mitigation Measures"					
a, b, c	Impact AQ-1: Short-Term Emissions of Criteria Air Pollutants and Precursors at Shasta Lake and Vicinity During Project Construction	☒	☐	☐	☐
a, b, c	Impact AQ-2: Long-Term Emissions of Criteria Air Pollutants and Precursors During Project Operation	☐	☐	☒	☐
a, d	Impact AQ-3: Exposure of Sensitive Receptors to Substantial Pollutant Concentrations	☐	☐	☒	☐
e	Impact AQ-4: Exposure of Sensitive Receptors to Odor Emissions	☐	☐	☒	☐
a, b, c	Impact AQ-5: Short-Term Emissions of Criteria Air Pollutants and Precursors Below Shasta Dam During Project Construction	☐	☐	☒	☐

Note:

[1] Impact AQ-6 is included under Section 2.2.7 "Greenhouse Gas Emissions" of this chapter.

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.4 Biological Resources

Table 2.2-4a shows preliminary impact determinations for the items in the Environmental Checklist Form related to biological resources. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-4b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to biological resources. The first column in Table 2.2-4b correlates to the questions for biological resources in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-4a. Biological Resources Section from CEQA Guidelines Appendix G – Environmental Checklist Form

IV. BIOLOGICAL RESOURCES: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, or National Marine Fisheries Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, or National Marine Fisheries Service?	☒	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☒	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☒	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☒	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 11, "Fisheries and Aquatic Resources" Section 11.3, "Environmental Consequences and Mitigation Measures"					
a, d	Impact Aqua-1: Effects on Nearshore, Warm-Water Habitat in Shasta Lake from Project Operations	☐	☐	☒	☐
a, d	Impact Aqua-2: Effects on Nearshore, Warm-Water Habitat in Shasta Lake from Project Construction	☐	☐	☒	☐
a, d	Impact Aqua-3: Effects on Cold-Water Habitat in Shasta Lake	☐	☐	☒	☐
a	Impact Aqua-4: Effects on Special-Status Aquatic Mollusks	☐	☒	☐	☐
a, d	Impact Aqua-5: Effects on Special-Status Fish Species	☐	☐	☒	☐
a, d	Impact Aqua-6: Creation or Removal of Barriers to Fish Between Tributaries and Shasta Lake	☐	☐	☒	☐
a, d	Impact Aqua-7: Effects on Spawning and Rearing Habitat of Adfluvial Salmonids in Low-Gradient Tributaries to Shasta Lake	☐	☒	☐	☐
d	Impact Aqua-8: Effects on Aquatic Connectivity in Non-Fish-Bearing Tributaries to Shasta Lake	☐	☐	☒	☐
a	Impact Aqua-9: Effects on Water Quality at Livingston Stone Hatchery	☐	☐	☐	☒
a, d	Impact Aqua-10: Loss or Degradation of Aquatic Habitat in the Upper Sacramento River During Construction Activities	☐	☐	☒	☐
a	Impact Aqua-11: Release and Exposure of Contaminants in the Upper Sacramento River During Construction Activities	☐	☐	☒	☐
a, d	Impact Aqua-12: Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operation—Chinook Salmon and Steelhead	☐	☐	☒	☐

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 11, "Fisheries and Aquatic Resources" Section 11.3, "Environmental Consequences and Mitigation Measures"					
a, d	Impact Aqua-13: Changes in Flow and Water Temperature in the Upper Sacramento River Resulting from Project Operation— Steelhead, Green Sturgeon, Sacramento Splittail, American Shad, and Striped Bass	☐	☐	☒	☐
a, b	Impact Aqua-14: Reduction in Ecologically Important Geomorphic Processes in the Upper Sacramento River Resulting from Reduced Frequency and Magnitude of Intermediate to High Flows	☐	☒	☐	☐
a, d	Impact Aqua-15: Changes in Flow and Water Temperatures in the Lower Sacramento River and Tributaries and Trinity River Resulting from Project Operation – Fish Species of Primary Management Concern	☐	☒	☐	☐
a, b	Impact Aqua-16: Reduction in Ecologically Important Geomorphic Processes in the Lower Sacramento River Resulting from Reduced Frequency and Magnitude of Intermediate to High Flows	☐	☒	☐	☐
a, d	Impact Aqua-17: Effects to Delta Fishery Habitat Resulting from Changes to Delta Outflow	☐	☐	☒	☐
a, d	Impact Aqua-18: Effects to Delta Fisheries Resulting from Changes to Delta Inflow	☐	☐	☒	☐
a, d	Impact Aqua-19: Effects to Delta Fisheries Resulting from Changes in Sacramento River Inflow	☐	☐	☒	☐
a, d	Impact Aqua-20: Effects to Delta Fisheries Resulting from Changes in San Joaquin River Flow at Vernalis	☐	☐	☐	☒
a, d	Impact Aqua-21: Reduction in Low-Salinity Habitat Conditions Resulting from an Upstream Shift in X2 Location	☐	☐	☒	☐
a, d	Impact Aqua-22: Increase in Mortality of Species of Primary Management Concern as a Result of Increased Reverse Flows in Old and Middle Rivers	☐	☐	☒	☐

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 11, "Fisheries and Aquatic Resources" Section 11.3, "Environmental Consequences and Mitigation Measures"					
a, d	Impact Aqua-23: Increase in the Risk of Entrainment or Salvage of Species of Primary Management Concern at CVP and SWP Export Facilities Due to Changes in CVP and SWP Exports	☐	☒	☐	☐
a, d	Impact Aqua-24: Impacts on Aquatic Habitats and Fish Populations in the CVP and SWP Service Areas Resulting from Modifications to Existing Flow Regimes	☐	☐	☒	☐
See EIS Chapter 12, "Botanical Resources and Wetlands" Section 12.3, "Environmental Consequences and Mitigation Measures"					
a	Impact Bot-1: Loss of Federally or State Listed Plant Species	☐	☐	☐	☒
N/A	Impact Bot-2: Loss of MSCS Covered Species	☒	☐	☐	☐
a	Impact Bot-3: Loss of USFS Sensitive, BLM Sensitive, or CRPR Species	☒	☐	☐	☐
c	Impact Bot-4: Loss of Jurisdictional Waters	☒	☐	☐	☐
a, b	Impact Bot-5: Loss of General Vegetation Habitats	☒	☐	☐	☐
e	Impact Bot-6: Spread of Noxious and Invasive Weeds	☐	☒	☐	☐
a, b, e, f	Impact Bot-7: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes	☐	☒	☐	☐
f	Impact Bot-8: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management	☐	☒	☐	☐
a, b	Impact Bot-9: Disturbance or Removal of Designated Critical Habitat for Special-Status Species	☐	☐	☒	☐
a, b	Impact Bot-10: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth	☐	☐	☒	☐

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 12, "Botanical Resources and Wetlands" Section 12.3, "Environmental Consequences and Mitigation Measures"					
a, b, c, f	Impact Bot-11: Loss of Sensitive Natural Communities or Habitats Resulting from Implementing the Gravel Augmentation Program or Restoring Riparian, Floodplain, and Side Channel Habitats	☐	☒	☐	☐
a	Impact Bot-12: Loss of Special-Status Plants Resulting from Implementing the Gravel Augmentation Program, or Restoring Riparian, Floodplain, and Side Channel Habitats	☐	☒	☐	☐
e	Impact Bot-13: Spread of Noxious and Invasive Weeds Resulting from Implementing the Gravel Augmentation Program, Restoring Riparian, Floodplain, and Side Channel Habitats	☐	☒	☐	☐
a, b, e, f	Impact Bot-14: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes on the Lower Sacramento River	☐	☒	☐	☐
b, e, f	Impact Bot-15: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management Along the Lower Sacramento River	☐	☒	☐	☐
a	Impact Bot-16: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth Along the Lower Sacramento River and in the Delta	☐	☐	☒	☐
a, b, e, f	Impact Bot-17: Altered Structure and Species Composition and Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Altered Flow Regimes in the CVP/SWP Service Areas	☐	☐	☒	☐
b, e, f	Impact Bot-18: Conflict with Approved Local or Regional Plans with Objectives of Riparian Habitat Protection or Watershed Management in the CVP/SWP Service Areas	☐	☐	☒	☐

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 12, "Botanical Resources and Wetlands" Section 12.3, "Environmental Consequences and Mitigation Measures"					
a	Impact Bot-19: Loss of Sensitive Plant Communities and Special-Status Plant Species Resulting from Induced Growth in the CVP/SWP Service Areas	☐	☐	☒	☐
See EIS Chapter 13, "Wildlife Resources" Section 13.3, "Environmental Consequences and Mitigation Measures"					
a, b, d	Impact Wild-1: Take and Loss of Habitat for the Shasta Salamander	☒	☐	☐	☐
a, b, d	Impact Wild-2: Impact on the Foothill Yellow-Legged Frog and Tailed Frog and Their Habitat	☒	☐	☐	☐
a, b, d	Impact Wild-3: Impact on the Northwestern Pond Turtle and Its Habitat	☒	☐	☐	☐
a	Impact Wild-4: Impact on the American Peregrine Falcon	☐	☒	☐	☐
a, b, d	Impact Wild-5: Take and Loss of Habitat for the Bald Eagle	☒	☐	☐	☐
a, b, d	Impact Wild-6: Loss of Dispersal Habitat for the Northern Spotted Owl	☐	☒	☐	☐
a, b, d	Impact Wild-7: Impact on the Purple Martin and Its Habitat	☒	☐	☐	☐
a, b, d	Impact Wild-8: Impacts on the Willow Flycatcher, Vaux's Swift, Yellow Warbler, and Yellow-Breasted Chat and Their Foraging and Nesting Habitat	☒	☐	☐	☐
a, b, d	Impact Wild-9: Impacts on the Long-Eared Owl, Northern Goshawk, Cooper's Hawk, Great Blue Heron, and Osprey and Their Foraging and Nesting Habitat	☒	☐	☐	☐
a, b, d	Impact Wild-10: Take and Loss of Habitat for the Pacific Fisher	☒	☐	☐	☐
a, b, d	Impact Wild-11: Impacts on Special-Status Bats (Pallid Bat, Spotted Bat, Western Red Bat, Western Mastiff Bat, Townsend's Big-Eared Bat, Long-Eared Myotis, and Yuma Myotis), the American Marten, and Ringtails and Their Habitat	☒	☐	☐	☐

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 13, "Wildlife Resources" Section 13.3, "Environmental Consequences and Mitigation Measures"					
a, b, d	Impact Wild-12: Impacts on Special-Status Terrestrial Mollusks (Shasta Sideband, Wintu Sideband, Shasta Chaparral, and Shasta Hesperian) and Their Habitat	☒	☐	☐	☐
d	Impact Wild-13: Permanent Loss of General Wildlife Habitat	☒	☐	☐	☐
a, b, d	Impact Wild-14: Impacts on Other Birds of Prey (Red-Tailed Hawk and Red-Shouldered Hawk) and Migratory Bird Species (American Robin, Anna's Hummingbird) and Their Foraging and Nesting Habitat	☒	☐	☐	☐
d	Impact Wild-15: Loss of Critical Deer Winter and Fawning Range	☒	☐	☐	☐
a, b, d	Impact Wild-16: Take and Loss of California Red-Legged Frog	TBD			
a, b, d	Impact Wild-17: Impacts on Riparian-Associated Special-Status Wildlife Resulting from Modifications to the Existing Flow Regime in the Primary Study Area	☐	☒	☐	☐
a, b, d	Impact Wild-18: Impacts on Bank Swallow in the Primary Study Area Resulting from Modifications of Geomorphic Processes	☐	☐	☒	☐
a, b, c	Impact Wild-19: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife from Changes in Flow Regime	☐	☐	☐	☒
b, e	Impact Wild-20: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat in the Primary Study Area	☐	☒	☐	☐
a, b, d	Impact Wild-21: Impacts on Riparian-Associated Special-Status Wildlife Resulting from the Gravel Augmentation Program	☐	☒	☐	☐
a, b, d	Impact Wild-22: Impacts on Riparian-Associated Special-Status Wildlife Species Resulting from Restoration Projects	☐	☒	☐	☐
a, b, d	Impact Wild-23: Impacts on Riparian-Associated and Aquatic Special-Status Wildlife Resulting from Modifications to Existing Flow Regimes in the Lower Sacramento River and Delta	☐	☒	☐	☐

Table 2.2-4b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Biological Resources (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 13, "Wildlife Resources" Section 13.3, "Environmental Consequences and Mitigation Measures"					
a, b, d	Impact Wild-24: Impacts on Bank Swallow Along the Lower Sacramento River Resulting from Modifications of Geomorphic Processes	☐	☐	☒	☐
a, b, c	Impact Wild-25: Disturbance or Removal of Vernal Pool Habitat for Special-Status Wildlife Along the Lower Sacramento River and in the Delta from Changes in Flow Regime of the Sacramento River and Affected Tributaries, and Changes in Seasonal Water Availability	☐	☐	☐	☒
b, e	Impact Wild-26: Consistency with Local and Regional Plans with Goals of Promoting Riparian Habitat along the Lower Sacramento River and in the Delta	☐	☒	☐	☐
a, b, d	Impact Wild-27: Impacts on Riparian-Associated or Aquatic Special-Status Wildlife in the CVP/SWP Service Areas Resulting from Modifications to Existing Flow Regimes	☐	☐	☒	☐

Key:
BLM = Bureau of Land Management
CEQA = California Environmental Quality Act
CRPR = California Rare Plant Rank
CVP = Central Valley Project
EIS = Environmental Impact Statement
MSCS = Multi-Species Conservation Strategy
SLWRI = Shasta Lake Water Resources Investigation
SWP = State Water Project
TBD = to be determined
USFS = U.S. Forest Service

2.2.5 Cultural Resources

Table 2.2-5a shows preliminary impact determinations for the items in the Environmental Checklist Form related to cultural resources. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-5b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to cultural resources. The first column in Table 2.2-5b correlates to the questions for cultural resources in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

CEQA Guidelines question c for Cultural Resources (e.g., paleontological resources) was considered in the 2014 SLWRI Final EIS. As described in Section 4.3.3 of Chapter 4, "Geology, Geomorphology, Minerals, and Soils" (Topics Eliminated from Further Discussion) of the SLWRI Final EIS, no unique paleontological resources were identified. A small area of the fossiliferous Cretaceous Chico Formation occurs near Jones Valley Creek, a tributary to the Pit Arm, but this rock unit is not exposed along the shoreline of the lake and is not associated with any relocation area. Some outcrops of McCloud Limestone, especially in the vicinity of the McCloud River Bridge, also contain fossil corals and other microinvertebrates. Some areas underlain by limestone are likely to be disturbed regardless of the action alternative being considered. However, the fossils that compose the McCloud Limestone are well documented in the scientific literature, and it is unlikely that paleontological resources of scientific or cultural significance occur in this formation. Accordingly, the EIR is not anticipated to address CEQA Guidelines Question c for Cultural Resources (see Table 2.2-5a).

Table 2.2-5a. Cultural Resources Section from CEQA Guidelines Appendix G – Environmental Checklist Form

V. CULTURAL RESOURCES: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-5b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Cultural Resources

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 14, "Cultural Resources" Section 14.3, "Environmental Consequences and Mitigation Measures"					
a, b, d	Impact Culture-1: Disturbance or Destruction of Archaeological and Historical Resources Due to Construction or Inundation	☐	☒	☐	☐
N/A	Impact Culture-2: Inundation of Traditional Cultural Properties	☒	☐	☐	☐
a, b, d	Impact Culture-3: Disturbance or Destruction of Archaeological and Historical Resources near the Upper Sacramento River Due to Construction	☐	☒	☐	☐

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
N/A = Not Applicable
SLWRI = Shasta Lake Water Resources Investigation

2.2.6 Geology and Soils

Table 2.2-6a shows preliminary impact determinations for the items in the Environmental Checklist Form related to geology and soils. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-6b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to geology and soils. The first column in Table 2.2-6b correlates to the questions for geology and soils in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

CEQA Guidelines question d for Geology and Soils (e.g., expansive soils) was considered in the 2014 SLWRI Final EIS. As described in Section 4.3.3 of Chapter 4 of the SLWRI Final EIS, "Geology, Geomorphology, Minerals, and Soils," (Topics Eliminated from Further Discussion), the likelihood that expansive soils occur in the Shasta Lake area and vicinity is low because the weathering products derived from the local bedrock typically contain low concentrations of "active" clays (e.g., montmorillonite). Accordingly, the EIR is not anticipated to address CEQA Guidelines Question d for Geology and Soils (see Table 2.2-6a).

Table 2.2-6a. Geology and Soils Section from CEQA Guidelines Appendix G – Environmental Checklist Form

VI. GEOLOGY AND SOILS: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death related to:	☐	☐	☒	☐
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☒	☐	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18- 1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-6b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Geology and Soils

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 4, "Geology, Geomorphology, Minerals and Soils" [1,2] Section 4.3, "Environmental Consequences and Mitigation Measures"					
a(i), (ii), (iii), (iv)	Impact Geo-1: Exposure of Structures and People to Geologic Hazards Resulting from Seismic Conditions, Slope Instability, and Volcanic Eruptions	☐	☐	☒	☐
b	Impact Geo-4: Lost or Diminished Soil Biomass Productivity	☒	☐	☐	☐
b	Impact Geo-5: Substantial Soil Erosion or Loss of Topsoil Due to Shoreline Processes	☒	☐	☐	☐
b	Impact Geo-6: Substantial Soil Erosion or Loss of Topsoil Due to Upland Processes	☐	☐	☒	☐
c	Impact Geo-7: Be Located on a Geologic Unit or Soil that Is Unstable, or that Would Become Unstable as a Result of the Project, and Potentially Result in Subsidence	☐	☐	☒	☐
e	Impact Geo-8: Failure of Septic Tanks or Alternative Wastewater Disposal Systems Due to Soils that are Unsuited to Land Application of Waste	☐	☐	☒	☐
b	Impact Geo-10: Substantial Soil Erosion or Loss of Topsoil Due to Construction	☐	☐	☒	☐

Note:

[1] Impacts Geo-2, Geo-9, Geo-11, Geo-12, Geo-13 and Geo-14 are included in Table 2.2-9b in Section 2.2.9 "Hydrology and Water Quality" of this chapter.

[2] Impact Geo-3 is are included in Table 2.2-11b in Section 2.4.11 "Mineral Resources" of this chapter.

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.7 Greenhouse Gas Emissions

Table 2.2-7a shows preliminary impact determinations for the items in the Environmental Checklist Form related to greenhouse gas emissions. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-7b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to greenhouse gas emissions. The first column in Table 2.2-7b correlates to the questions for greenhouse gas emissions in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-7a. Greenhouse Gas Emissions Section from CEQA Guidelines Appendix G – Environmental Checklist Form

VII. GREENHOUSE GAS EMISSIONS: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with any applicable plan, policy or regulation of an agency adopted for the purposed of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-7b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Greenhouse Gas Emissions

CEQA Guidelines Question	**Impact from 2014 SLWRI Final EIS**	**Impact Determinations in 2014 SLWRI Final EIS**			
		Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
See EIS Chapter 5, "Air Quality and Climate" Section 5.3, "Environmental Consequences and Mitigation Measures"					
a, b	Impact AQ-6: Generation of Greenhouse Gases	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.8 Hazards and Hazardous Materials

Table 2.2-8a shows preliminary impact determinations for the items in the Environmental Checklist Form related to hazards and hazardous materials. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-8b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to hazards and hazardous materials. The first column in Table 2.2-8b correlates to the questions for hazards and hazardous materials in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

CEQA Guidelines question c for Hazards and Hazardous Materials (e.g., emit hazardous emissions with one-quarter mile of a school) was considered in the 2014 SLWRI Final EIS. As described in Section 9.3.4 of Chapter 9 of the SLWRI Final EIS, “Hazards and Hazardous Materials and Waste” (Direct and Indirect Effects) there is one school located about 4 miles from Shasta Dam. Project activity would occur while school is in session. Although Reclamation would implement measures to lessen the risk of hazardous materials exposure to sensitive receptors at schools and other locations, this impact would be potentially significant. The EIR will provide additional information for CEQA Guidelines question c for Hazards and Hazardous Materials.

CEQA Guidelines question f for Hazards and Hazardous Materials (e.g., project located within an airport land use plan) was also considered in the 2014 SLWRI Final EIS. As described in Section 20.3.3 of Chapter 20 of the SLWRI Final EIS, “Transportation and Traffic” (Topics Eliminated from Further Discussion), none of the airports (Redding Municipal, Benton Airpark, Shingletown, and Fall River Mills) in the primary study area are located near the project site. In addition, no private airstrips are located in the reservoir area. Accordingly, the EIR is not anticipated to address CEQA Guidelines question f for Hazards and Hazardous Materials (see Table 2.2-8a).

CEQA Guidelines question g for Hazards and Hazardous Materials (e.g., impair or interfere with an adopted emergency response plan) was considered in the 2014 SLWRI Final EIS. Potential impacts to implementation of emergency response plans are described in Section 9.3.4 of Chapter 9 of the SLWRI Final EIS, “Hazards and Hazardous Materials and Waste” (Direct and Indirect Effects) and Section 22.3.4 of Chapter 22, “Public Services” (Direct and Indirect Effects). Project construction could result in short-term disruption of emergency services response. Short-term traffic delays and access restrictions would require traffic controls and coordination with public services agencies. Although Reclamation would implement measures to lessen short-term disruption of public services, this impact would be potentially significant. Construction activities associated with enlarging Shasta Dam and related infrastructure (e.g., road relocations, bridge replacements) near the dam and near relocation sites for utilities, roads, and structures could temporarily disrupt transportation and circulation patterns in the vicinity, which could affect emergency services response. Emergency preparedness, emergency communications, and emergency supplies, including food and shelter for emergency crews and public services staff, could also be affected by project implementation because of temporary increases in the work force. The EIR will provide additional information for CEQA Guidelines question g for Hazards and Hazardous Materials.

Table 2.2-8a. Hazards and Hazardous Materials Section from CEQA Guidelines Appendix G – Environmental Checklist Form

VIII: HAZARDS AND HAZARDOUS MATERIALS: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Create a significant hazard to the public or the environment through the routine transport, use, storage or disposal of hazardous materials?	☐	☒	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one- quarter mile of an existing or proposed school?	☐	☒	☐	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a substantial safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☒	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☒	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-8b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Hazards and Hazardous Materials

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 9, "Hazards and Hazardous Materials and Waste" Section 9.3, "Environmental Consequences and Mitigation Measures"					
h	Impact Haz-1: Wildland Fire Risk (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☒	☐	☐
a, b	Impact Haz-2: Release of Potentially Hazardous Materials or Hazardous Waste (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☒	☐	☐
a, b, d	Impact Haz-3: Exposure of Workers to Hazardous Materials (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☐	☒	☐
a, b, c, d	Impact Haz-4: Exposure of Sensitive Receptors to Hazardous Materials (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☒	☐	☐
h	Impact Haz-5: Wildland Fire Risk (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☒	☐
a, b	Impact Haz-6: Release of Potentially Hazardous Materials or Hazardous Waste (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☒	☐
a, b, d	Impact Haz-7: Exposure of Workers to Hazardous Materials (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☒	☐
a, b, d	Impact Haz-8: Exposure of Sensitive Receptors to Hazardous Materials (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act
CVP = Central Valley Project
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation
SWP = State Water Project

2.2.9 Hydrology and Water Quality

Table 2.2-9a shows preliminary impact determinations for the items in the Environmental Checklist Form related to hydrology and water quality. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-9b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to hydrology and water quality. The first column in Table 2.2-9b correlates to the questions for hydrology and water quality in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-9a. Hydrology and Water Quality Section from CEQA Guidelines Appendix G – Environmental Checklist Form

IX. HYDROLOGY and WATER QUALITY: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Violate any water quality standards or waste discharge requirements?		☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local ground water table level (for example, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐
d) Substantially alter the existing drainage patterns of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☒	☐	☐
e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐
f) Otherwise substantially degrade water quality?	☐	☒	☐	☐
g) Place housing within a 100-year flood-hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

Table 2.2-9a. Hydrology and Water Quality Section from CEQA Guidelines Appendix G – Environmental Checklist Form (contd.)

IX. HYDROLOGY and WATER QUALITY: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
h) Place within a 100-year flood-hazard area structures which would impede or redirect flood flows?	☐	☐	☒	☐
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-9b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Hydrology and Water Quality

CEQA Guidelines Question	**Impact from 2014 SLWRI Final EIS**	**Impact Determinations in 2014 SLWRI Final EIS**			
		Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
See EIS Chapter 6, "Hydrology, Hydraulics, and Water Management" Section 6.3, "Environmental Consequences and Mitigation Measures"					
d, e, h, i	Impact H&H-1: Change in Frequency of Flows Above 100,000 cfs on the Sacramento River Below Bend Bridge	☐	☐	☒	☐
g, h	Impact H&H-2: Place Housing or Other Structures Within a 100-Year Flood Hazard Area as Mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or Other Flood Hazard Delineation Map	☐	☐	☐	☒
g, h	Impact H&H-3: Place Within a 100-Year Flood Hazard Area Structures That Would Impede or Redirect Flood Flows	☐	☐	☐	☒
N/A	Impact H&H-4: Change in Water Levels in the Old River near Tracy Road Bridge	☐	☐	☒	☐
N/A	H&H-5: Change in Water Levels in the Grant Line Canal near the Grant Line Canal Barrier	☐	☐	☒	☐
N/A	Impact H&H-6: Change in Water Levels in the Middle River near the Howard Road Bridge	☐	☐	☒	☐
a, f	Impact H&H-7: Change in X2 Position	☐	☐	☒	☐

Table 2.2-9b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Hydrology and Water Quality (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 6, "Hydrology, Hydraulics, and Water Management" Section 6.3, "Environmental Consequences and Mitigation Measures"					
N/A	Impact H&H-8: Change in Recurrence of Delta Excess Conditions	☐	☐	☒	☐
N/A	Impact H&H-9: Change in Deliveries to North-of-Delta CVP Water Service Contractors and Refuges	☐	☐	☒	☐
N/A	Impact H&H-10: Change in Deliveries to South-of-Delta CVP Water Service Contractors and Refuges	☐	☐	☒	☐
N/A	Impact H&H-11: Change in Deliveries to SWP Table A, Contractors	☐	☐	☒	☐
b	Impact H&H-12: Change in Groundwater	☐	☐	☒	☐
a	Impact H&H-13: Change in Groundwater Quality	☐	☐	☒	☐
See EIS Chapter 7, "Water Quality" Section 7.3, "Environmental Consequences and Mitigation Measures"					
a, c	Impact WQ-1: Temporary Construction-Related Sediment Effects on Shasta Lake and Its Tributaries that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☒	☐	☐
a, f	Impact WQ-2: Temporary Construction-Related Temperature Effects on Shasta Lake and Its Tributaries that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, c	Impact WQ-3: Temporary Construction-Related Metal Effects on Shasta Lake and Its Tributaries that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, c	Impact WQ-4: Long-Term Sediment Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	☐	☒	☐	☐

Table 2.2-9b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Hydrology and Water Quality (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 7, "Water Quality" Section 7.3, "Environmental Consequences and Mitigation Measures"					
a, f	Impact WQ-5: Long-Term Temperature Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	☐	☐	☒	☐
a, c	WQ-6: Long-Term Metals Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in Shasta Lake or Its Tributaries	☐	☒	☐	☐
a, c	Impact WQ-7: Temporary Construction-Related Sediment Effects on the Upper Sacramento River that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☒	☐	☐
a, f	Impact WQ-8: Temporary Construction-Related Temperature Effects on the Upper Sacramento River that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, c	Impact WQ-9: Temporary Construction-Related Metal Effects on the Upper Sacramento River that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, c	Impact WQ-10: Long-Term Sediment Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	☐	☐	☒	☐
a, f	Impact WQ-11: Long-Term Temperature Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	☐	☐	☒	☐
a, c	Impact WQ-12: Long-Term Metals Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Upper Sacramento River	☐	☒	☐	☐

Table 2.2-9b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Hydrology and Water Quality (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 7, "Water Quality" Section 7.3, "Environmental Consequences and Mitigation Measures"					
a	Impact WQ-13: Temporary Construction-Related Sediment Effects on the Extended Study Area that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, f	Impact WQ-14: Temporary Construction-Related Temperature Effects on the Extended Study Area that Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, f	Impact WQ-15: Temporary Construction-Related Metal Effects on the Extended Study Area that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses	☐	☐	☒	☐
a, f	Impact WQ-16: Long-Term Sediment Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	☐	☐	☒	☐
a, f	Impact WQ-17: Long-Term Temperature Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	☐	☐	☒	☐
a, f	Impact WQ-18: Long-Term Metals Effects that Would Cause Violations of Water Quality Standards or Adversely Affect Beneficial Uses in the Extended Study Area	☐	☒	☐	☐
a, f	Impact WQ-19a: Delta Salinity on the Sacramento River at Collinsville	☐	☐	☒	☐
a, f	Impact WQ-19b: Delta Salinity on the San Joaquin River at Jersey Point	☐	☐	☒	☐
a, f	Impact WQ-19c: Delta Salinity on the Sacramento River at Emmaton	☐	☐	☒	☐
a, f	Impact WQ-19d: Delta Salinity on the Old River at Rock Slough	☐	☐	☒	☐
a, f	Impact WQ-19e: Delta Water Quality on the Delta-Mendota Canal at Jones Pumping Plant	☐	☐	☒	☐

Table 2.2-9b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Hydrology and Water Quality (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 7, "Water Quality" Section 7.3, "Environmental Consequences and Mitigation Measures"					
a, f	Impact WQ-19f: Delta Water Quality on the West Canal at the Mouth of the Clifton Court Forebay	☐	☐	☒	☐
a, f	Impact WQ-19g: Delta Salinity on the San Joaquin River at Vernalis	☐	☐	☒	☐
a, f	Impact WQ-19h: Delta Salinity on the San Joaquin River at Brandt Bridge	☐	☐	☒	☐
a, f	Impact WQ-19i: Delta Salinity on the Old River near the Middle River	☐	☐	☒	☐
a, f	Impact WQ-19j: Delta Salinity on the Old River at Tracy Road Bridge	☐	☐	☒	☐
a, f	Impact WQ-20: X2 Position	☐	☐	☒	☐
See EIS Chapter 4, "Geology, Geomorphology, Minerals and Soils" Section 4.3, "Environmental Consequences and Mitigation Measures"					
j	Impact Geo-1: Exposure of Structures and People to Geologic Hazards Resulting from Seismic Conditions, Slope Instability, and Volcanic Eruptions	☐	☐	☒	☐
c, d	Impact Geo-2: Alteration of Fluvial Geomorphology and Hydrology of Aquatic Habitats	☐	☒	☐	☐
c, d	Impact Geo-9: Substantial Increase in Channel Erosion and Meander Migration	☐	☐	☒	☐
c, d	Impact Geo-11: Alteration of Fluvial Geomorphology	☐	☐	☒	☐
c, d	Impact Geo-12: Alteration of Downstream Tributary Fluvial Geomorphology Due to Shasta Dam Operations	☐	☐	☒	☐
c, d	Impact Geo-13: Substantial Increase in Channel Erosion and Meander Migration (Lower Sacramento River and Delta)	☐	☐	☒	☐
c, d	Impact Geo-14: Substantial Increase in Channel Erosion and Meander Migration (CVP/SWP Service Areas)	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act
cfs = cubic feet per second
CRPR = California Rare Plant Rank
CVP = Central Valley Project
EIS = Environmental Impact Statement
N/A = not applicable
SLWRI = Shasta Lake Water Resources Investigation
SWP = State Water Project

2.2.10 Land Use and Planning

Table 2.2-10a shows preliminary impact determinations for the items in the Environmental Checklist Form related to land use and planning. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-10b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to land use and planning. The first column in Table 2.2-10b correlates to the questions for land use and planning in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

The EIR will provide additional information for CEQA Guidelines question a for Land Use and Planning (e.g., physically divide and established community).

Table 2.2-10a. Land Use and Planning Section from CEQA Guidelines Appendix G – Environmental Checklist Form

X. LAND USE AND PLANNING: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☒	☐	☐	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Key:
CEQA = California Environmental Quality Act

Table 2.2-10b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Land Use Planning

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 17, "Land Use and Planning" Section 17.3, "Environmental Consequences and Mitigation Measures"					
b	Impact LU-1: Disruption of Existing Land Uses (Shasta Lake and Vicinity and Upper Sacramento River)	☒	☐	☐	☐
b	Impact LU-2: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Shasta Lake and Vicinity and Upper Sacramento River)	☒	☐	☐	☐
b	Impact LU-3: Disruption of Existing Land Uses (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒
b	Impact LU-4: Conflict with Existing Land Use Goals and Policies of Affected Jurisdictions (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒
b	Impact WASR-1: McCloud River's Eligibility for Listing as a Federal Wild and Scenic River	☒	☐	☐	☐
b	Impact WASR-2: Conflict with Shasta-Trinity National Forest, Land and Resource Management Plan	☐	☐	☐	☒
b	Impact WASR-3: Effects to McCloud River Wild Trout Fishery, as Identified in the California Public Resources Code, Section 5093.542	TBD			
b	Impact WASR-4: Effects to McCloud River Free-Flowing Conditions, as Identified in the California Public Resources Code, Section 5093.542	TBD			
See EIS Chapter 19, "Aesthetics and Visual Resources" Section 19.3, "Environmental Consequences and Mitigation Measures"					
b	Impact Vis-1: Consistency with Guidelines for Visual Resources in the STNF LRMP (Shasta Lake and Vicinity and Upper Sacramento River)	☒	☐	☐	☐

Key:
CEQA = California Environmental Quality Act
CRPR = California Rare Plant Rank
CVP = Central Valley Project
EIS = Environmental Impact Statement
LRMP = Land and Resource Management Plan
SLWRI = Shasta Lake Water Resources Investigation
STNF = Shasta-Trinity National Forest
SWP = State Water Project
TBD = to be determined

2.2.11 Mineral Resources

Table 2.2-11a shows preliminary impact determinations for the items in the Environmental Checklist Form related to mineral resources. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-11b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to mineral resources. The first column in Table 2.2-11b correlates to the questions for mineral resources in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-11a. Mineral Resources Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XI. MINERAL RESOURCES: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☒	☐	☐	☐
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☒	☐	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-11b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Mineral Resources

CEQA Guidelines Question	**Impact from 2014 SLWRI Final EIS**	**Impact Determinations in 2014 SLWRI Final EIS**			
		Potentially Significant Impact	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
See EIS Chapter 4, "Geology, Geomorphology, Minerals and Soils" Section 4.3, "Environmental Consequences and Mitigation Measures"					
a, b	Impact Geo-3: Loss or Diminished Availability of Known Mineral Resources That Would Be of Future Value to the Region	☒	☐	☐	☐

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.12 Noise

Table 2.2-12a shows preliminary impact determinations for the items in the Environmental Checklist Form related to noise. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-12b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to noise. The first column in Table 2.2-12b correlates to the questions for noise in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

CEQA Guidelines questions e and f for Noise (e.g., project located near an airport or within an airport land use plan) was considered in the 2014 SLWRI Final EIS. As described in Section 8.3.3 of Chapter 8, "Noise and Vibration," (Topics Eliminated from Further Discussion), none of the project alternatives would expose people residing or working in the project area to excessive aircraft-generated noise levels because of the distance of existing airports to the project area. In addition, none of the alternatives would place new sensitive receptors near any aircraft-related facilities. Accordingly, the EIR is not anticipated to address CEQA Guidelines questions e and f for Noise (see Table 2.2-12a).

Table 2.2-12a. Noise Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XII. NOISE: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☒	☐	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above existing levels without the project?	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Key:
CEQA = California Environmental Quality Act

Table 2.2-12b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Noise

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 8, "Noise and Vibration" Section 8.3, "Environmental Consequences and Mitigation Measures"					
a, b, d	Impact Noise-1: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Construction Noise	☐	☒	☐	☐
a, b, d	Impact Noise-2: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Vibration During Construction	☐	☐	☒	☐
a, c	Impact Noise-3: Exposure of Sensitive Receptors in the Primary Study Area to Project-Generated Mobile Source Noise During Operations	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.13 Population and Housing

Table 2.2-13a shows the questions in Section XIII – Population and Housing of Appendix G (Environmental Checklist Form) of the CEQA Guidelines. The EIR will provide additional information for CEQA Guidelines questions a, b and c for Population and Housing.

Table 2.2-13a. Population and Housing Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XIII. POPULATION AND HOUSING: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Induce substantial growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	TBD			
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	TBD			
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	TBD			

Key:
CEQA = California Environmental Quality Act
TBD = to be determined

2.2.14 Public Services

Table 2.2-14a shows preliminary impact determinations for the items in the Environmental Checklist Form related to public services. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-14b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to public services. The first column in Table 2.2-14b correlates to the questions for public services in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-14a. Public Services Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XIV. PUBLIC SERVICES: Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Fire protection?	☐	☒	☐	☐
b) Police protection?	☐	☒	☐	☐
c) Schools?	☐	☐	☒	☐
d) Parks?	☐	☒	☐	☐
e) Other public facilities?	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-14b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Public Services

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 22, "Public Services" Section 22.3, "Environmental Consequences and Mitigation Measures"					
a, b, c, d, e	Impact PS-1: Disruption of Public Services (Shasta Lake and Vicinity and Upper Sacramento River	☐	☒	☐	☐
a, b, c, d, e	Impact PS-2: Degraded Level of Public Services (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☒	☐	☐
a, d, e	Impact PS-3: Relocation of Public Service Facilities (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☐	☒	☐
a, b, c, d, e	Impact PS-4: Short-Term Disruption of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒
a, b, c, d, e	Impact PS-5: Degraded Levels of Public Services (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☒	☐
a, b, c, d, e	Impact PS-6: Relocation of Public Services Facilities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒

Key:
CEQA = California Environmental Quality Act
CVP = Central Valley Project
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation
SWP = State Water Project

2.2.15 Recreation

Table 2.2-15a shows preliminary impact determinations for the items in the Environmental Checklist Form related to recreation. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-15b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to recreation. The first column in Table 2.2-15b correlates to the questions for recreation in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-15a. Recreation Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XV. RECREATION: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☒	☐	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☒	☐	☐

Key:
CEQA = California Environmental Quality Act

Table 2.2-15b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Recreation

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 18, "Recreation and Public Access" Section 18.3, "Environmental Consequences and Mitigation Measures"					
a, b	Impact Rec-1: Seasonal Inundation of Shasta Lake Recreation Facilities or Portions of Recreation Facilities and Public Access at Pool Elevations Above the Current Full Pool Elevation	☐	☐	☒	☐
a, b	Impact Rec-2: Temporary Construction-Related Disruption of Recreation Access and Activities at and near Shasta Dam	☐	☒	☐	☐
a	Impact Rec-3: Effects on Boating and Other Recreation Use and Enjoyment of Shasta Lake as a Result of Changes in the Annual Drawdown of the Reservoir	☐	☐	☒	☐
a, b	Impact Rec-4: Increased Hazards to Boaters and Other Recreationists at Shasta Lake from Standing Timber and Stumps Remaining in Untreated Areas of the Inundation Zone	☐	☒	☐	☐
a	Impact Rec-5: Seasonal Inundation of Portions of Recreation Facilities or Informal River Access Sites as a Result of Increased River Flows	☐	☐	☒	☐
a	Impact Rec-6: Increased Difficulty for Boaters in Using the Sacramento River as a Result of Increased River Flows	☐	☐	☒	☐
a	Impact Rec-7: Increased Difficulty for Swimmers and Waders in Using the Sacramento River as a Result of Increased River Flows	☐	☐	☒	☐
a	Impact Rec-8: Increased Usability of the Sacramento River for Boating and Water-Contact Recreation as a Result of Decreased River Flows	☐	☐	☒	☐
a	Impact Rec-9: Enhanced Angling Opportunities in the Upper Sacramento River as a Result of Improved Flows and Reduced Water Temperatures	☐	☐	☒	☐

Table 2.2-15b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Recreation (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 18, "Recreation and Public Access" Section 18.3, "Environmental Consequences and Mitigation Measures"					
a	Impact Rec-10: Disruption of Sacramento River Boating and Access Resulting from the Gravel Augmentation Program	☐	☐	☒	☐
a	Impact Rec-11: Changes in Usability of Reading Island Fishing Access Boat Ramp and Enhanced Recreation at Upper Sacramento River Restoration Sites	☐	☐	☒	☐
a	Impact Rec-12: Seasonal Inundation of Portions of River Recreation Facilities or Informal River Access Sites on the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	☐	☐	☒	☐
a	Impact Rec-13: Increased Difficulty for Boaters in Using the Lower Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	☐	☐	☒	☐
a	Impact Rec-14: Increased Difficulty for Swimmers and Waders in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Increased River Flows	☐	☐	☒	☐
a	Impact Rec-15: Increased Difficulty for Boaters and Anglers in Using the Sacramento River and Rivers Below CVP and SWP Reservoirs as a Result of Decreased River Flows	☐	☒	☐	☐

Key:
CEQA = California Environmental Quality Act
CVP = Central Valley Project
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation
SWP = State Water Project

2.2.16 Transportation and Traffic

Table 2.2-16a shows preliminary impact determinations for the items in the Environmental Checklist Form related to transportation/traffic. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-16b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to transportation/traffic. The first column in Table 2.2-16b correlates to the questions for transportation/traffic in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

CEQA Guidelines question c for Transportation and Traffic (e.g., airport related) was considered in the 2014 SLWRI Final EIS. As described in Section 20.3.3 of Chapter 20 of the SLWRI Final EIS, “Transportation and Traffic,” (Topics Eliminated from Further Discussion), none of the airports (Redding Municipal, Benton Airpark, Shingletown, and Fall River Mills) in the primary study area are located near the project site; therefore, project construction and operation would not affect air traffic patterns. In addition, the project would not affect the ability of seaplanes to land at Bridge Bay Resort Seaplane Base. Accordingly, the EIR is not anticipated to address CEQA Guidelines Question c for Transportation and Traffic (see Table 2.2-16a).

CEQA Guidelines question f for Transportation and Traffic (e.g., public transit, bicycle/pedestrian facilities) was considered in the 2014 SLWRI Final EIS. As described in Section 20.3.3 of Chapter 20 of the SLWRI Final EIS, “Transportation and Traffic,” (Topics Eliminated from Further Discussion), none of the alternatives propose any facility that is in conflict with adopted policies, plans, or programs supporting alternative transportation. Accordingly, the EIR is not anticipated to address CEQA Guidelines Question f for Transportation and Traffic (see Table 2.2-16a).

Table 2.2-16a. Transportation and Traffic Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XVI. TRANSPORTATION/TRAFFIC: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☒	☐	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☒	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☒	☐	☐
e) Result in inadequate emergency access?	☐	☒	☐	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

Key:
CEQA = California Environmental Quality Act

Table 2.2-16b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Transportation and Traffic

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 20, "Transportation and Traffic" Section 20.3, "Environmental Consequences and Mitigation Measures"					
a, b, d, e	Impact Trans-1: Short-Term and Long-Term Increases in Traffic in the Primary Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	☐	☒	☐	☐
a, b, d, e	Impact Trans-2: Adverse Effects on Access to Local Streets or Adjacent Uses in the Primary Study Area	☐	☒	☐	☐
d	Impact Trans-3: Hazards in the Primary Study Area Caused by a Design Feature	☐	☐	☒	☐
e	Impact Trans-4: Adverse Effects on Emergency Access in the Primary Study Area	☐	☒	☐	☐
b	Impact Trans-5: Accelerated Degradation of Surface Transportation Facilities in the Primary Study Area	☐	☒	☐	☐
a, b, d, e	Impact Trans-6: Temporary Increase in Traffic in the Extended Study Area in Relation to the Existing Traffic Load and Capacity of the Street System	☐	☐	☐	☒
a, b, d, e	Impact Trans-7: Adverse Effects on Access to Local Streets or Adjacent Uses in the Extended Study Area	☐	☐	☐	☒
d	Impact Trans-8: Hazards in the Extended Study Area Caused by a Design Feature	☐	☐	☐	☒
e	Impact Trans-9: Adverse Effects on Emergency Access in the Extended Study Area	☐	☐	☐	☒
b	Impact Trans-10: Accelerated Degradation of Surface Transportation Facilities in the Extended Study Area	☐	☐	☐	☒

Key:
CEQA = California Environmental Quality Act
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation

2.2.17 Tribal Cultural Resources

Assembly Bill 52 (AB 52) was enacted in September 2014 and formally established a category of resources in the CEQA Environmental Checklist called "tribal cultural resources." As the 2014 SLWRI Final EIS was undergoing final processing and review when AB 52 was enacted, it did not address impacts to tribal cultural resources as a separate resource category. Consistent with AB 52, the EIR will provide additional information for CEQA Guidelines questions a, b and c for tribal cultural resources.

Table 2.2.17a. Tribal Cultural Resources Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XVII. TRIBAL CULTURAL RESOURCES: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:	TBD			
i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)? or	TBD			
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?	TBD			

Key:
CEQA = California Environmental Quality Act
TBD = to be determined

2.2.18 Utilities and Service Systems

Table 2.2-18a shows preliminary impact determinations for the items in the Environmental Checklist Form related to utilities and service systems. These preliminary impact determinations are based primarily on the analysis in the 2014 SLWRI Final EIS. Refinements to these impact determinations may occur through scoping and the subsequent analysis supporting the CEQA process. Table 2.2-18b shows the impact statements from the 2014 SLWRI Final EIS that are relevant to utilities and service systems. The first column in Table 2.2-18b correlates to the questions for utilities and service systems in the CEQA Guidelines for each impact statement in the 2014 SLWRI Final EIS.

Table 2.2-18a. Utilities and Service Systems Section from CEQA Guidelines Appendix G – Environmental Checklist Form

XVIII. UTILITES AND SERVICE SYSTEMS: Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☒	☐	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☒	☐	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☒	☐	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☒	☐	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	

Key:
CEQA = California Environmental Quality Act

Table 2.2-18b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Utilities and Service Systems

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 21, "Utilities and Service Systems" Section 21.3, "Environmental Consequences and Mitigation Measures"					
a, b, c, d, e	Impact Util-1: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☒	☐	☐
a, b, c, d, e	Impact Util-2: Utility Infrastructure Relocation or Modification (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☒	☐	☐
f, g	Impact Util-3: Short-Term Increase in Solid Waste Generation (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☐	☒	☐
f, g	Impact Util-4: Increases in Solid Waste Generation from Increased Recreational Opportunities (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☐	☒	☐
b, d	Impact Util-5: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Shasta Lake and Vicinity and Upper Sacramento River)	☐	☐	☐	☐
a, b, c, d, e	Impact Util-6: Damage to or Disruption of Public Utility and Service Systems Infrastructure (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒
a, b, c, d, e	Impact Util-7: Utility Infrastructure Relocation or Modification (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒
f, g	Impact Util-8: Short-Term Increase in Solid Waste Generation (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☒	☐
f, g	Impact Util-9: Increases in Solid Waste Generation from Increased Recreational Opportunities (Lower Sacramento River, Delta, CVP/SWP Service Areas)	☐	☐	☐	☒

Table 2.2-18b. Impacts from 2014 SLWRI Final EIS Corresponding to CEQA Guidelines Questions for Utilities and Service Systems (contd.)

CEQA Guidelines Question	Impact from 2014 SLWRI Final EIS	Impact Determinations in 2014 SLWRI Final EIS			
		Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
See EIS Chapter 21, "Utilities and Service Systems" Section 21.3, "Environmental Consequences and Mitigation Measures"					
b, d	Impact Util-10: Increased Demand for Water Treatment and Distribution Facilities Resulting from Increases in Water Supply (Lower Sacramento River, Delta, CVP/SWP Service Areas)	TBD			
See EIS Chapter 23, "Power and Energy" Section 23.3, "Environmental Consequences and Mitigation Measures"					
	Impact Hydro-1: Decrease in Shasta Powerplant Energy Generation	☐	☐	☐	☐
	Impact Hydro-2: Decrease in CVP System Energy Generation	☐	☐	☒	☐
	Impact Hydro-3: Decrease in SWP System Energy Generation	☐	☐	☒	☐
	Impact Hydro-4: Increase in CVP System Pumping Energy Use	☐	☐	☒	☐
	Impact Hydro-5: Increase in SWP System Pumping Energy Use	☐	☐	☒	☐
	Impact Hydro-6: Decrease in Pit 7 Powerplant Energy Generation	☐	☐	☒	☐

Key:
CEQA = California Environmental Quality Act
CVP = Central Valley Project
EIS = Environmental Impact Statement
SLWRI = Shasta Lake Water Resources Investigation
SWP = State Water Project

CHAPTER 3
REFERENCES

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EXHIBIT G

WESTLANDS WATER DISTRICT BOARD OF DIRECTORS
MEETING OFSEPTEMBER 18, 2018
ITEM 15

SUBJECT

Consider Authorizing the District to Retain Consultants to Prepare an Environmental Impact Report Pursuant to the California Environmental Quality Act for the Shasta Lake Water Resources Investigation (Raising Shasta Reservoir).

DISCUSSION

Reclamation's FY2018 budget includes $20 million for design and pre-construction of the Enlargement of Shasta Dam and Reservoir ('Project'). If this work is completed promptly, it is reasonable to expect that Reclamation could begin construction sometime in 2019. However, per section 4007(b)(3) of the Water Infrastructure Improvements for the Nation Act, Reclamation cannot begin construction of the Project until an agreement has been executed for the financing of the non-Federal share of the costs. Therefore, to adhere to Reclamation's schedule, local cost-share partners would need to be ready to commit to financing 50% of the Project in 2019. Before the District or any other state or local agency could participate as a local cost share partner, it would have to ensure CEQA compliance by next year.

Currently, there are Project details that are uncertain and that would need to be addressed before the District could determine whether to serve as a local cost share partner, such as how the beneficiaries are defined, what the yield might be, how the Project will be financed, how the 50% local cost share portion of the financing would be distributed among the beneficiaries, etc. Notwithstanding these uncertainties, which staff anticipate will be addressed in the coming months, the CEQA compliance work should commence as soon as possible in order to adhere to the current schedule. Accordingly, District staff requested a draft scope of work and cost estimate from Stantec for: 1) evaluation of whether the Project has an adverse effect on the free-flowing condition or the wild trout fishery on the McCloud River, 2) review of existing compliance documents on the Shasta dam raise project, and 3) preparation of all necessary documents to ensure CEQA compliance, as provided in more detail in the attached preliminary scope of work and cost estimate from Stantec. If the Board authorizes staff to engage Stantec, District staff will work to refine the scope of work. District staff also anticipates that it will retain project management and legal support.

RECOMMENDATION

1. Authorize and direct the General Manager or his designee to execute agreements with consultants to help evaluate where the Project has an adverse effect on the free-flowing condition or the wild trout fishery on the McCloud River, to review existing compliance documents on the Shasta dam raise project, and to prepare all necessary documents to ensure CEQA compliance.

2. Authorize and direct General Manager or his designee to execute and deliver any and all documents to do and cause to be done any and all acts and things necessary or proper for carrying out the activities contemplated herein.

EXHIBIT H

Reim, Garrett <greim@usbr.gov>

Fwd: Shasta Raise - Agreement in Principle for Potential Cost Sharing

From: **van Rijn, David** <dvanrijn@usbr.gov>
Date: Mon, Feb 12, 2018 at 8:05 AM
Subject: Fwd: Shasta Raise - Agreement in Principle for Potential Cost Sharing
To: John Menniti <jmenniti@usbr.gov>, Donald Bader <dbader@usbr.gov>, "WELSH, RICHARD" <rwelsh@usbr.gov>

Cc: Brian Hughes <bhughes@usbr.gov>, SHANA KAPLAN <skaplan@usbr.gov>, Michael Mosley <mmosley@usbr.gov>

John, Don and Richard,
Should have included you guys.

David van Rijn
Regional Planning Officer
Reclamation's Mid-Pacific Region
dvanrijn@usbr.gov
916-978-5062

---------- Forwarded message ----------
From: **van Rijn, David** <dvanrijn@usbr.gov>
Date: Sun, Feb 11, 2018 at 6:53 PM
Subject: Shasta Raise - Agreement in Principle for Potential Cost Sharing
To: rfreeman@westlands.org, Alicia Forsythe <aforsythe@usbr.gov>, SHANA KAPLAN <skaplan@usbr.gov>
Cc: Brian Hughes <bhughes@usbr.gov>

Russ,
It was great meeting you at the Water User's Conference. I'm following up on my email and our discussion concerning the Agreement in Principle for Potential Cost Sharing of the Shasta Raise (attached). As we discussed the current Agreement in Principle expired in September 2017. This administration is very interested in infrastructure and is very interested in Shasta Raise. I would like to see if Westlands is interested in renewing this agreement. A current or up-to-date agreement could make a difference in the Administration's and Congress's interest in authorizing and/or funding the project.

Please contact me at your earliest convenience to discuss this.

David van Rijn
Regional Planning Officer
Reclamation's Mid-Pacific Region
dvanrijn@usbr.gov
916-978-5062

Shasta Raise agreement with Westland (1) (1).pdf
74K

EXHIBIT I

From:	Jose Gutierrez
To:	lbair@rd108.com; tbettner@gcid.net; jsutton@tccanal.com; cwhite@ccidwater.org; jphillips@friantwater.org; jpayne@friantwater.org; afecko@pcwa.net; Federico Barajas; rjacobsma@ccwater.com; elimas@ltrid.org; sdalke@kern-tulare.com; jpeifer@cityofsacramento.org; vlucchesi@pattersonid.org; J. Scott Petersen
Cc:	Johnny Amaral; Karen Clark" (kclark@westlandswater.org); mpatil@ccwater.com; Dan Pope
Subject:	Update on Shasta Dam Raise Project
Date:	Wednesday, March 6, 2019 2:02:34 PM

Westlands looks forward to seeing everyone at tomorrow's meeting at 3:30 at our Sacramento office. Please let me know if you plan to attend in person so we can place your name on the building's security list.

We want to continue the discussion we started last month regarding the option to have Westlands sign a cost sharing agreement with Reclamation and serve as the local cost share partner, and to develop repayment agreements for Westlands to be repaid by CVP contractors.

We will also have our consultant present to present the water supply modeling results and answer your questions. Thank you and see everyone tomorrow.

Jose Gutierrez, P.E.
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